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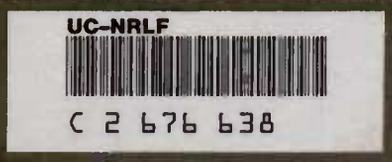

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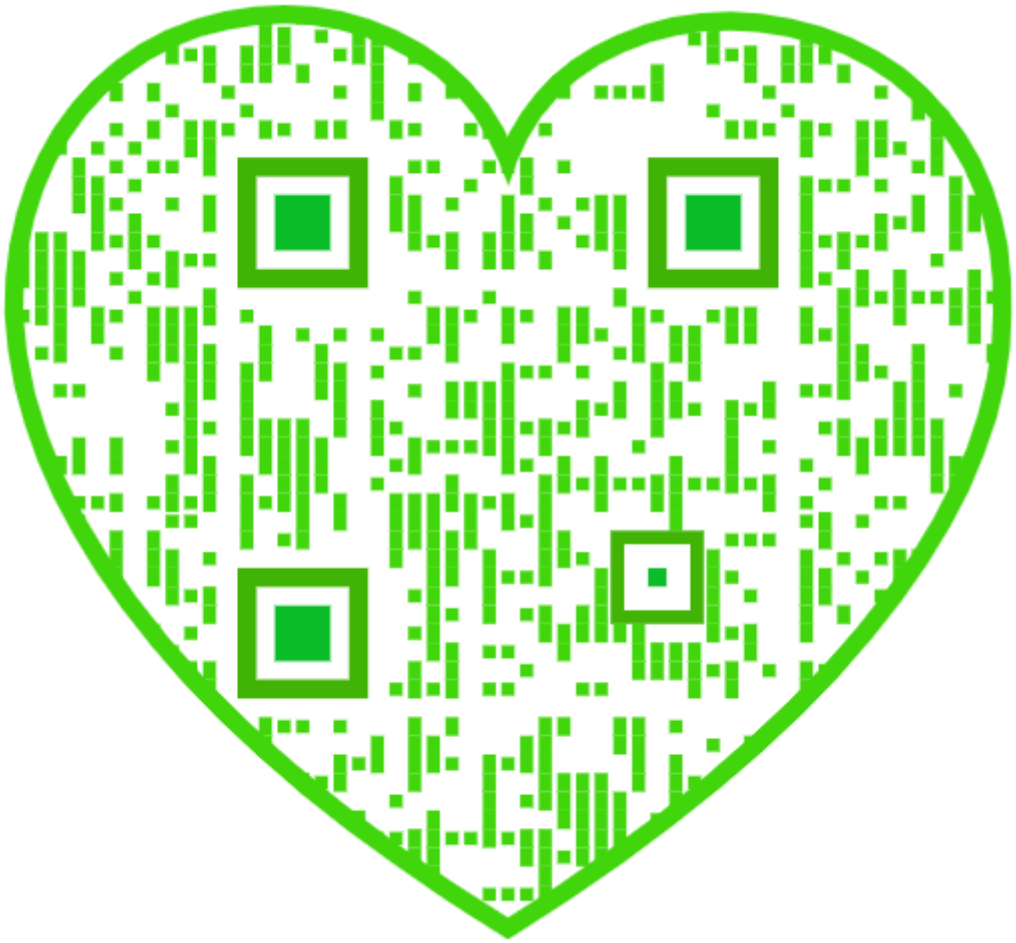
TABLES

FOR FINDING STRAINS

IN

RAILWAY BRIDGE TRUSSES

DU BOIS



TABLES

FOR

FINDING THE STRAINS

IN

RAILWAY BRIDGE TRUSSES

UNDER THE ACTION OF A

CONCENTRATED LOAD SYSTEM.

REPRINTED FROM STRAINS IN FRAMED STRUCTURES.

SECOND EDITION.

BY

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PREFACE.

THESE Tables are intended to aid those engaged in the calculation of trusses. The system of concentrated loads annexed, is very closely that generally laid down in the specifications of our principal railroads. The use of the tables will be found sufficiently illustrated for all those for whom they are designed. The principles upon which the calculations are based are given at length in the author's work, "*Strains in Framed Structures*," from which these Tables are reprinted.

December 10, 1884.

TABLE I.

CONCENTRATED LOAD SYSTEM.

SHEAR.

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TABLE I.

CONCENTRATED LOAD SYSTEM.

SHEAR.

EXPLANATION OF TABLE.

THE load-system adopted is given in Table I. It consists of two locomotives with tenders, followed by train; the wheel-weights and distances being given in the first column. The locomotive agrees closely with the "standard consolidated engine," usually specified by the best railroad and bridge companies. It is believed that the load-system assumed is such as will give, in every case, results slightly in excess of the heaviest possible loading which can actually occur in practice.

The use of Table I. is quite simple. The length of span is l. The load always comes on *from right*. The maximum shear at any point. distant x from *the left end*, is given by one of *four* formulæ. These formulæ, and the limits between which they hold good, are given at the head of the table. For the *first eight feet* of any span we must use formula (I.). From $x = 8$ up to a certain *limit* we must use (II.). This limit is given in the table to right, for every length of span from 27 to 300. Thus, for a span of 100 feet, this limit is $47\frac{1}{3}$ feet *from the left end*. From this limit, up to $x = l - 8$, we must use formula (III.). At the limit, both (II.) and (III.) give the same result. For the *last eight feet* of span we use formula (IV.).

Thus, for instance, for a span of 200 feet, we must use (I.) from $x = o$ up to $x = 8$. From $x = 8$ up to $x = 89\frac{1}{3}$ we must use (II.). From $x = 89\frac{1}{3}$ up to $x = 192$ we must use (III.). From $x = 192$ up to $x = 200$ we must use (IV.).

The table gives the values of P and A for the corresponding value of $l - x$, or $l - x - 8$.

Thus, suppose we wish the maximum shear for a span of 200 *feet, at* 7, 80, 100, *and* 195 *feet from end, load coming on always from right.*

For $x = 7$ we use formula (I.). We have, then, $l = 200$, $l - x = 193$. From table, we see that for any value of $l - x$ between 190 and 195 we have $P = 527000$, and $A = 41730000$. Hence, for $x = 7$,

$$\text{Shear} = \frac{527000}{200}193 - \frac{41730000}{200} = 299905 \text{ lbs.}$$

In like manner, for $x = 80$, we have $l - x = 120$, $l - x + 8 = 128$; and, since the limit is $89\frac{1}{3}$, we must use formula (II.). We have from table, for $l - x = 120$, $P = 383000$, and $A = 19410000$; and, hence,

$$\text{Shear} = \frac{15000}{200}128 + \frac{383000}{200}120 - \frac{19410000}{200} - 15000 = 127350 \text{ lbs.}$$

Observe that the table gives these values of P and A for any value of $l - x$ *between* 115 *and* 120, *including* 120. For any value of $l - x$ between 120 and 125, *including* 120, we have, also, $P = 395000$, $A = 20850000$; and these values in formula (II.) would give the same result. Thus,

$$\text{Shear} = \frac{15000}{200}128 + \frac{395000}{200}120 - \frac{20850000}{200} - 15000 = 127350 \text{ lbs.}$$

For $x = 100$, we have $l - x = 100$, $l - x - 8 = 92$; and, since the limit is $89\frac{1}{3}$, we must use formula (III.). We have from table, for $l - x - 8 = 92$, $P = 335000$, $A = 14370000$; and, hence,

$$\text{Shear} = \frac{15000}{200}100 + \frac{335000}{200}92 - \frac{14370000}{200} = 89750 \text{ lbs.}$$

For $x = 195$, since this falls within the last 8 feet, we must use formula (IV.). We have, then, $l - x = 5$; and

$$\text{Shear} = \frac{15000}{200}5 = 375 \text{ lbs.}$$

Whenever formulæ (I.) or (II.) apply, the second wheel is at the point: when (III.) or (IV.) apply, the first wheel is at the point.

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TABLE I.

CONCENTRATED LOAD SYSTEM.

SHEAR.

l = length of span.

x = distance from left end, in feet, of any point at which the maximum shear is required.

Values of P and A to be taken from table for corresponding $l - x$, or $l - x - 8$.

(I.) *From $x = o$ to $x = 8$, second wheel at point,* $\left.\right\}$ $\text{Shear} = \frac{P}{l}(l - x) - \frac{A}{l}$.

From $x = 8$ to limit, second wheel at point, $\left.\right\}$ $\text{Shear} = \frac{p_1}{l}(l - x + 8) + \frac{P}{l}(l - x) - \frac{A}{l} - 15000.$ (II.)

Limit to be found from table on right, $p_1 = 15000$.

(III.) *From $x =$ limit to $x = l - 8$, first wheel at point,* $\left.\right\}$ $\text{Shear} = \frac{p_1}{l}(l - x) + \frac{P}{l}(l - x - 8) - \frac{A}{l}$.

From $x = l - 8$ to $x = l$, first wheel at point, $\left.\right\}$ $\text{Shear} = \frac{p_1}{l}(l - x)$. (IV.)

Weights, lbs.	Distances.	$l-x$ or $l-x-8$.	P	A	Weights, lbs.	Distances.	$l-x$ or $l-x-8$.	P	A	Span. feet	Limit x.	Span. feet.	Limit. x.
Locomotive. $p_1 = 15000$	ft.				Car. $p_{18} = 15000$	ft.	91						
	8					4		335000	14370000	27	18.6	61	38.5
Locomotive. $p_2 = 25000$		0			Car. $p_{19} = 12000$		95			28	19	62	$39\frac{1}{3}$
	5		25000	0		5		347000	15510000	29	19.4	63	$39\frac{1}{3}$
Locomotive. $p_3 = 25000$		5			Car. $p_{20} = 12000$		100			30	19.9	64	$39\frac{1}{3}$
	5		50000	125000		10		359000	16710000	31	20.6	65	$39\frac{1}{3}$
Locomotive. $p_4 = 25000$		10			Car. $p_{21} = 12000$		110			32	21.3	66	$39\frac{1}{3}$
	5		75000	375000		5		371000	18030000	33	22	67	$39\frac{1}{3}$
Locomotive. $p_5 = 25000$		15			Car. $p_{22} = 12000$		115			34	22 7	68	$40\frac{1}{6}$
	7		100000	750000		5		383000	19410000	35	23.4	69	$40\frac{1}{3}$
Tender. $p_6 = 15000$		22			Car. $p_{23} = 12000$		120			36	24.1	70	$41\frac{1}{6}$
	5		115000	1080000		5		395000	20850000	37	24.8	71	$41\frac{1}{3}$
Tender. $p_7 = 15000$		27			Car. $p_{24} = 12000$		125			38	25.5	72	$42\frac{1}{6}$
	5		130000	1485000		10		407000	22350000	39	26.2	73	$42\frac{1}{3}$
Tender. $p_8 = 15000$		32			Car. $p_{25} = 12000$		135			40	26.8	74	$42\frac{1}{3}$
	5		145000	1965000		5		419000	23970000	41	27.2	75	$42\frac{1}{3}$
Tender. $p_9 = 15000$		37			Car. $p_{26} = 12000$		140			42	27 6	76	$43\frac{1}{6}$
	9		160000	2520000		5		431000	25650000	43	28	77	$43\frac{1}{3}$
Locomotive. $p_{10} = 15000$		46			Car. $p_{27} = 12000$		145			44	28 7	78	$44\frac{1}{6}$
	8		175000	3210000		5		443000	27390000	45	29.4	79	$44\frac{1}{3}$
Locomotive. $p_{11} = 25000$		54			Car. $p_{28} = 12000$		150			46	30.1	80	$45\frac{1}{6}$
	5		200000	4560000		10		455000	29190000	47	30.8	81	$45\frac{1}{3}$
Locomotive. $p_{12} = 25000$		59			Car. $p_{29} = 12000$		160			48	31.5	82	$45\frac{1}{3}$
	5		225000	6035000		5		467000	31110000	49	32.2	83	$45\frac{1}{3}$
Locomotive. $p_{13} = 25000$		64			Car. $p_{30} = 12000$		165			50	32.9	84	$46\frac{1}{6}$
	5		250000	7635000		5		479000	33090000	51	33.6	85	$46\frac{1}{3}$
Locomotive. $p_{14} = 25000$		69			Car. $p_{31} = 12000$		170			52	34.3	86	$47\frac{1}{6}$
	7		275000	9360000		5		491000	35130000	53	35	87	$47\frac{1}{3}$
Tender. $p_{15} = 15000$		76			Car. $p_{32} = 12000$		175			54	35.4	88	$48\frac{1}{6}$
	5		290000	10500000		10		503000	37230000	55	35.8	89	$48\frac{1}{3}$
Tender. $p_{16} = 15000$		81			Car. $p_{33} = 12000$		185			56	36.2	90	$48\frac{1}{3}$
	5		305000	11715000		5		515000	39450000	57	36.6	91	$48\frac{1}{3}$
Tender. $p_{17} = 15000$		86			Car. $p_{34} = 12000$		190			58	37	92	$48\frac{1}{3}$
	5		320000	13005000		5		527000	41730000	59	37.4	93	$48\frac{1}{3}$
Tender. $p_{18} = 15000$		91			Car. $p_{35} = 12000$		195			60	$37\frac{1}{8}$	94	$47\frac{1}{3}$

TABLE I.

CONCENTRATED LOAD SYSTEM.

SHEAR.

l = length of span.

x = distance from left end, in feet, of any point at which the maximum shear is required.

Values of P and A to be taken from table for corresponding $l - x$, or $l - x - 8$.

(I.) *From $x = o$ to $x = 8$, second wheel at point,* $\left.\right\}$ Shear $= \frac{P}{l}(l - x) - \frac{A}{l}$.

From $x = 8$ to limit, second wheel at point, $\left.\right\}$ Shear $= \frac{p_1}{l}(l - x + 8) + \frac{P}{l}(l - x) - \frac{A}{l} - 15000.$ (II.)

Limit to be found from table on right, $p_1 = 15000$.

(III.) *From $x =$ limit to $x = l - 8$, first wheel at point,* $\left.\right\}$ Shear $= \frac{p_1}{l}(l - x) + \frac{P}{l}(l - x - 8) - \frac{A}{l}$.

From $x = l - 8$ to $x = l$, first wheel at point, $\left.\right\}$ Shear $= \frac{p_1}{l}(l - x).$ (IV.)

Weights, lbs.		Distances	$l-x$ or $l-x-8$.	P	A	Span.	Limit.	Span.	Limit.	Span.	Limit.	Span.	Limit.	Span.	Limit.	Span.	Limit.
						feet.	x.	feet.	x.	feet.	x.	feet.	x.	feet.	x.	feet.	x.
		ft.	195														
Car.	$p_{35} = 12000$	5		539000	44070000	95	47 1/4	128	62.5	161	79 1/2	194	91 11/12	227	89 7/12	260	91 1/3
	$p_{36} = 12000$		200			96	47 1/3	129	63.2	162	79 5/8	195	92 7/24	228	89 1/3	261	91 1/12
	$p_{37} = 12000$	10		551000	46470000	97	47 1/3	130	63 9	163	80 1/3	196	92 1/3	229	89 1/12	262	91 1/24
	$p_{38} = 12000$	5	210	563000	48990000	98	47 1/3	131	64.6	164	80 5/8	197	92 1/12	230	89 5/12	263	91 1/24
		5	215			99	47 1/3	132	65.3	165	81 1/4	198	91 5/8	231	89 1/24	264	92 1/8
	$p_{39} = 12000$		220	575000	51570000	100	47 1/3	133	66	166	81 1/3	199	91 7/12	232	90 1/6	265	92 1/24
		5				101	47 1/3	134	66.4	167	81 1/3	200	89 1/3	233	90 1/24	266	92 1/8
	$p_{40} = 12000$	5	225	587000	54210000	102	47.6	135	66.8	168	81 5/8	201	89 1/12	234	90 1/8	267	92 7/12
		10				103	48	136	67.2	169	82 1/4	202	88 5/8	235	90 1/12	268	92 1/3
	$p_{41} = 12000$		235	599000	56910000	104	48.4	137	67.8	170	82 1/3	203	88 7/12	236	90 1/8	269	93 1/24
		5				105	48.8	138	68.5	171	83 1/3	204	88 1/3	237	91 1/24	270	93 1/12
	$p_{42} = 12000$		240	611000	59730000	106	49.2	139	69.2	172	83 5/8	205	89 1/24	238	91 1/12	271	93 1/24
		5				107	49.6	140	69.9	173	84 1/3	206	89 1/12	239	91 1/24	272	94 1/8
	$p_{43} = 12000$		245	623000	62610000	108	50	141	70.6	174	84 1/3	207	90 1/12	240	92 1/8	273	94 1/12
		5				109	50.4	142	71.3	175	84 5/8	208	90 1/8	241	92 1/12	274	93 1/8
	$p_{44} = 12000$		250	635000	65550000	110	50.9	143	72	176	84 5/8	209	90 1/12	242	91 1/12	275	93 1/12
		10				111	51.6	144	72.7	177	85 1/3	210	89 1/12	243	92 7/24	276	93 1/8
	$p_{45} = 12000$		260	647000	68550000	112	52.3	145	73.4	178	85 5/8	211	90 1/24	244	92 1/8	277	91 1/12
		5				113	53	146	74.1	179	86 1/3	212	90 1/8	245	93 1/24	280	90 1/8
	$p_{46} = 12000$		265	659000	71670000	114	53.7	147	74.6	180	86 5/8	213	91 1/24	246	93 1/12	281	90 1/24
		5				115	54.4	148	75	181	87 1/3	214	91 1/12	247	93 1/12	285	92 1/24
	$p_{47} = 12000$		270	671000	74850000	116	55.1	149	75.4	182	87 5/8	215	91 1/12	248	93 1/8	286	91 1/8
		5				117	55.8	150	75.8	183	87 23/24	216	91 1/8	249	93 1/12	287	91 1/24
	$p_{48} = 12000$		275	683000	78090000	118	56.5	151	76.2	184	88 7/24	217	91 1/24	250	92 5/6	291	93 1/24
		5				119	57.2	152	76.6	185	88 1/24	218	91 1/12	251	90 7/12	292	93 1/8
	$p_{49} = 12000$		285	695000	81390000	120	57.8	153	77	186	89 7/24	219	92 7/24	252	90 1/8	293	93 1/12
		10				121	58.2	154	77.4	187	89 1/24	220	92 1/8	253	90 1/12	294	93 1/12
	$p_{50} = 12000$		290	707000	84810000	122	58.6	155	78 1/4	188	90 7/24	221	93 1/24	254	89 5/6	295	93 1/24
		5				123	59	156	78 1/3	189	90 1/24	222	92 1/8	255	89 11/12	296	94 1/8
	$p_{51} = 12000$		295	719000	88290000	124	59.7	157	78 2/3	190	90 5/8	223	92 1/12	256	90 1/6	297	94 1/24
		5				125	60.4	158	78 1/4	191	90 1/24	224	92 1/8	257	90 1/24	298	94 1/8
	$p_{52} = 12000$		300	731000	91830000	126	61.1	159	78 2/3	192	91 1/6	225	92 1/12	258	90 1/12	299	94 1/12
		5				127	61.8	160	78 5/8	193	91 1/24	226	89 5/8	259	91 1/24	300	94 1/8

TABLE II.

CONCENTRATED LOAD SYSTEM.

* In applying II. to a *framed girder*, if the panel length is *more than* 8 *feet*, we must put instead of 15000 ($= p_1$), that *portion* of p_1 only, which, by the law of the lever, takes effect at the 1st apex on left of p_1.

TABLE I.

CONCENTRATED LOAD SYSTEM.

SHEAR.

l = length of span.

x = distance from left end, in feet, of any point at which the maximum shear is required.

Values of P and A to be taken from table for corresponding $l - x$, or $l - x - 8$.

(I.) *From $x = o$ to $x = 8$, second wheel at point,* $\left.\right\}$ $\text{Shear} = \frac{P}{l}(l - x) - \frac{A}{l}$.

From $x = 8$ to limit, second wheel at point, $\left.\right\}$ $\text{Shear} = \frac{p_1}{l}(l - x + 8) + \frac{P}{l}(l - x) - \frac{A}{l} - 15000.$ (II.)

Limit to be found from table on right, $p_1 = 15000$.

(III.) *From $x =$ limit to $x = l - 8$, first wheel at point,* $\left.\right\}$ $\text{Shear} = \frac{p_1}{l}(l - x) + \frac{P}{l}(l - x - 8) - \frac{A}{l}$.

From $x = l - 8$ to $x = l$, first wheel at point, $\left.\right\}$ $\text{Shear} = \frac{p_1}{l}(l - x)$. (IV.)

Weights, lbs.	Distances	$l - x$ or $l - x - 8$.	P	A	Span. feet.	Limit. x.	Span. feet.	Limit. x.	Span. feet.	Limit. x.	Span. feet.	Limit. x.	Span. feet.	Limit. x.	Span. feet.	Limit. x.

TABLE II.

CONCENTRATED LOAD SYSTEM.

MOMENTS.

TABLE II.

CONCENTRATED LOAD SYSTEM.

MOMENTS.

EXPLANATION OF TABLE.

For the maximum moment at any point of any span given in the table, simply multiply the value of the reaction R by the value of x, the distance of point from the left end, and subtract the value of m. The index of p, in the last column, shows the number of the wheel which must rest on the point, and hence the position of the load-system on the span. The load-system itself is given in Table I.

Thus, for span of 200 feet: —

At 5 feet from left end, the reaction at left end is $R = 305175$ lbs. The moment is

$$Rx = 305175 \times 5 = 1525875.$$

The second wheel of the system must rest on the point.

At 10 feet from left, the reaction is $R = 306850$ lbs. The moment is

$$Rx - m = 306850 \times 10 - 120000 = 2948500.$$

The second wheel of the system must rest on the point.

At 20 feet from left, the reaction is $R = 293600$ lbs. The moment is

$$Rx - m = 293600 \times 20 - 320000 = 5552000.$$

The third wheel of the system must rest on the point.

To find the moment *at a point not given by the table*, find the reaction R for this point by interpolation, and then proceed as before. Thus,

At 30.7 feet from left, the reaction is $280650 - (280650 - 278060)\frac{7}{10} = 278837$. The moment is

$$Rx - m = 278837 \times 30.7 - 645000 = 7915296.$$

The fourth wheel of the system must rest on the point.

If, however, this point *falls between two "fields,"* find the *moment* by interpolation. Thus,

At 45.4 feet from left, we have the moment at 45, $255050 \times 45 - 1095000 = 10382250$. The moment at 46 is $270290 \times 46 - 1900000 = 10533340$. At 45.4, then, we have

$$10382250 + (10533340 - 10382250)\frac{4}{10} = 10442686.$$

The fifth or sixth wheel at point, indifferently.

In general, it will not be necessary to interpolate, but will be sufficient to take the nearest foot given in the table.

To find the moment at any point of a span not given in the table, find the moment *at the same point* for the two nearest spans given, and interpolate.

Thus, span 204 feet, moment at 10 feet from left: —

The moment at 10 feet from left, for a span of 200 feet, is 2948500. The moment at 10 feet from left, for span of 210 feet, is 3063330. The moment at 10 feet from left, for 204 feet span, is, then,

$$2948500 + (3063330 - 2948500)\frac{4}{10} = 2994432.$$

The second wheel of system at point.

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TABLE II.

CONCENTRATED LOAD SYSTEM.

MOMENTS.

$$M_x = Rx - m.$$

Span, 10 feet.				Span, 11 feet.				Span, 12 feet.				Span, 13 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	32500			1	34090			1	37500			1	40384		
2	27500			2	29545			2	31250			2	34615		
3	22500	0	p_2	3	25000	0	p_2	3	27083	0	p_2	3	28846	0	p_2
4	17500			4	20454			4	22916			4	25000		
5	12500			5	25909			5	18750			5	21153		
				6	21363										
								6	37500	125000	p_3	6	40384	125000	p_3
												7	34615		

Span, 14 feet.				Span, 15 feet.				Span, 16 feet.				Span, 17 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	42857			1	45000			1	46875			1	50000		
2	37500			2	40000			2	42187			2	44117		
3	32142	0	p_2	3	35000	0	p_2	3	37500	0	p_2	3	39705	0	p_2
4	26785			4	30000			4	32812			4	35294		
5	23214			5	25000			5	28125			5	30882		
6	42857	125000	p_3	6	45000	125000	p_3	6	46875	125000	p_3	6	50000	125000	p_3
7	37500			7	40000			7	42187			7	44117		
				8	35000			8	37500			8	39705		
												9	35294		

MOMENTS.

$$M_x = Rx - m.$$

Span, 18 feet.				Span, 19 feet.				Span, 20 feet.				Span, 21 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	52777			1	55263			1	57500			1	59523		
2	47222			2	50000			2	52500			2	54761		
3	41666	0	p_2	3	44736	0	p_2	3	47500	0	p_2	3	50000	0	p_2
4	37500			4	39473			4	42500			4	45238		
5	33333			5	35526			5	37500			5	40476		
6	52777			6	55263			6	57500			6	59523		
7	47222	125000		7	50000	125000		7	52500	125000		7	54761	125000	
8	41666		p_3	8	44736		p_3	8	47500		p_3	8	50000		p_3
9	37500			9	39473			9	42500			9	45238		
				10	35526			10	37500			10	40476		
												11	35714		

Span, 22 feet.				Span, 23 feet.				Span, 24 feet.				Span, 25 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	61363			1	63043			1	65208			1	67200		
2	56818			2	58695			2	60416			2	62600		
3	52272	0	p_2	3	54847	0	p_2	3	56250	0	p_2	3	58000	0	p_2
4	47727			4	50000			4	52083			4	54000		
5	43181			5	45652			5	47915			5	50000		
6	61363			6	63043			6	65208			6	67200		
7	56818			7	58695			7	60416			7	62600		
8	52272	125000		8	54847	125000		8	56250	125000		8	58000	125000	
9	47727		p_3	9	50000		p_3	9	52083		p_3	9	54000		p_3
10	43181			10	45652			10	47915			10	50000		
11	38636			11	41304			11	43749			11	46000		
				12	36956			12	39582			12	42000		
												13	38000		

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 26 feet.				SPAN, 27 feet.				SPAN, 28 feet.				SPAN, 29 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	69038			1	70740			1	72321			1	74306		
2	64615			2	66481			2	68213			2	69820		
3	60192	0	p_2	3	62222	0	p_2	3	64106	0	p_2	3	65855	0	p_2
4	55769			4	57962			4	60000			4	61889		
5	51923			5	53703			5	55891			5	57924		
				6	50000			6	51783			6	53958		
6	69038														
7	64615			7	66481			7	68213			7	69820		
8	60192			8	62222			8	64106			8	65855		
9	55769	125000	p_3	9	57962	125000	p_3	9	60000	125000	p_3	9	61889	125000	p_3
10	51923			10	53703			10	55891			10	57924		
11	48076			11	50000			11	51783			11	53958		
12	44230			12	46296			12	48212			12	49993		
13	40384			13	42592			13	44640			13	46544		
				14	53333	320000	p_3	14	55533	320000	p_3	14	57578	320000	p_3
												15	53612		

SPAN, 30 feet.				SPAN, 31 feet.				SPAN, 32 feet.				SPAN, 33 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	76166			1	77903			1	79531			1	81060		
2	71833			2	73709			2	75468			2	77121		
3	67500	0	p_2	3	69516	0	p_2	3	71406	0	p_2	3	73181	0	p_2
4	63666			4	65322			4	67343			4	69242		
5	59833			5	61612			5	63281			5	65303		
6	56000			6	57903			6	59687			6	61363		
7	71833			7	73709			7	75468			7	77121		
8	67500			8	69516			8	71406			8	73181		
9	63666			9	65322			9	67343			9	69242		
10	59833	125000	p_3	10	61612	125000	p_3	10	63281	125000	p_3	10	65303	125000	p_3
11	56000			11	57903			11	59687			11	61363		
12	52166			12	54193			12	56093			12	57878		
13	48333			13	50483			13	52500			13	54393		
14	59500	320000	p_3	14	61290	320000	p_3	14	63436	320000	p_3	14	65454	320000	p_3
15	55666			15	57580			15	59373			15	61514		
				16	53870			16	55780			16	57574		
												17	54090		

MOMENTS.

$$M_x = Rx - m.$$

Span, 34 feet.				Span, 35 feet.				Span, 36 feet.				Span, 37 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	82941			1	84714			1	86388			1	87972		
2	78676			2	80571			2	82361			2	84054		
3	74852	0	p_2	3	76428	0	p_2	3	78333	0	p_2	3	80135	0	p_2
4	71029			4	72714			4	74305			4	76216		
5	67205			5	69000			5	70694			5	72297		
6	63382			6	65285			6	67083			6	68702		
7	78676			7	80571			7	82361			7	84054		
8	74852			8	76428			8	78333			8	80135		
9	71029	125000		9	72714	125000		9	74305	125000		9	76216	125000	
10	67205		p_3	10	69000		p_3	10	70694		p_3	10	72297		p_3
11	63382			11	65285			11	67083			11	68702		
12	59558			12	61571			12	63472			12	65108		
13	56176			13	57857			13	59861			13	61513		
14	67353			14	69143			14	70833			14	72513		
15	63528	320000		15	65428	320000		15	67221	320000		15	68512	320000	
16	59705		p_3	16	61714		p_3	16	63611		p_3	16	65000		p_3
17	55822			17	58000			17	60000			17	61486		
				18	54286			18	56388			18	57937		
												19	54460		

Span, 38 feet.				Span, 38 feet.				Span, 39 feet.				Span, 39 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	89473			14	74737			1	91282			14	76538		
2	85657			15	70921			2	87179			15	72819		
3	81842	0	p_2	16	67105	320000	p_3	3	83461	0	p_2	16	69102	320000	p_3
4	78027			17	63685			4	79743			17	65384		
5	74211			18	60263			5	76025			18	62050		
6	70395							6	72307						
7	85657			19	74737	645000	p_4	7	87179			19	76538	645000	p_4
8	81842							8	83461						
9	78027	125000						9	79743	125000					
10	74211		p_3					10	76025		p_3				
11	70395							11	72307						
12	66974							12	68589						
13	63553							13	65256						

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 40 feet.				SPAN, 41 feet.				SPAN, 42 feet.				SPAN, 43 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	93000			1	94634			1	96190			1	97674		
2	89000			2	90731			2	92380			2	93953		
3	85000	0	p_2	3	86829	0	p_2	3	88571	0	p_2	3	90232	0	p_2
4	81375			4	82926			4	84761			4	86511		
5	77750			5	79390			5	80952			5	82790		
6	74125			6	75853			6	77500			6	79069		
7	89000			7	90731			7	92380			7	93953		
8	85000			8	86829			8	88571			8	90232		
9	81375			9	82926			9	84761			9	86511		
10	77750	125000	p_3	10	79390	125000	p_3	10	80952	125000	p_3	10	82790	125000	p_3
11	74125			11	75853			11	77500			11	79069		
12	70500			12	72317			12	74047			12	75697		
13	66875			13	68780			13	70595			13	72325		
14	78250			14	79877			14	81784			14	83604		
15	74625			15	76341			15	77975			15	79883		
16	71000	320000	p_3	16	72804	320000	p_3	16	74523	320000	p_3	16	76162	320000	p_3
17	67375			17	69267			17	71071			17	72790		
				18	65730			18	67618			18	69417		
18	81875														
19	78250	645000	p_4	19	79877	645000	p_4	19	81784	645000	p_4	19	83604	645000	p_4
20	74625			20	76341			20	77975			20	79883		
				21	72804			21	74523			21	76162		
												22	72790		

SPAN, 44 feet.				SPAN, 44 feet.				SPAN, 45 feet.				SPAN, 45 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	99090			14	85340			1	100444			14	87000		
2	95454			15	81704			2	96888			15	83444		
3	91818	0	p_2	16	78067	320000	p_3	3	93333			16	80000	320000	p_3
4	88181			17	74431			4	89777	0	p_2	17	76333		
5	84545			18	71135			5	86222			18	72777		
6	80909							6	82666						
				19	85340			7	79111			19	87000		
7	95454			20	81704	645000	p_4					20	83444	645000	p_4
8	91818			21	78067			8	93333			21	80000		
9	88181			22	74431			9	89777			22	76333		
10	84545	125000	p_3					10	86222	125000	p_3	23	72777		
11	80909							11	82666						
12	77272							12	79111						
13	73977							13	75555						

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 46 feet.				SPAN, 47 feet.				SPAN, 48 feet.				SPAN, 49 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	101739			1	102978			1	104479			1	105918		
2	98260			2	99574			2	100834			2	102346		
3	94782			3	96170			3	97500			3	98775		
4	91304	0	p_2	4	92765	0	p_2	4	94166	0	p_2	4	95509	0	p_2
5	87826			5	89361			5	90833			5	92244		
6	84347			6	85957			6	87500			6	88978		
7	80869			7	82553			7	84166			7	85712		
8	94782			8	96170			8	97500			8	98775		
9	91304			9	92765			9	94166			9	95509		
10	87826	125000	p_3	10	89361	125000	p_3	10	90833	125000	p_3	10	92244	125000	p_3
11	84347			11	85957			11	87500			11	88978		
12	80869			12	82553			12	84166			12	85712		
13	77391			13	79148			13	80833			13	82446		
14	88586			14	90424			14	92187			14	93874		
15	85107			15	86701			15	88541			15	90302		
16	81629	320000	p_3	16	83297	320000	p_3	16	84895	320000	p_3	16	86729	320000	p_3
17	78151			17	79893			17	81563			17	83159		
18	74673			18	76489			18	78229			18	79893		
19	88586			19	90424			19	92187			19	93874		
20	85107			20	86701			20	88541			20	90302		
21	81629	645000	p_4	21	83297	645000	p_4	21	84895	645000	p_4	21	86729	645000	p_4
22	78151			22	79893			22	81563			22	83159		
23	74673			23	76489			23	78229			23	79893		
				24	73085			24	74896			24	76628		
												25	73363		

SPAN, 50 feet.				SPAN, 50 feet.				SPAN, 51 feet.				SPAN, 51 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	107300			14	95500			1	108627			14	97057		
2	103800			15	92000			2	105196			15	93626		
3	100300			16	88500	320000	p_3	3	101764			16	90195	320000	p_3
4	96800	0	p_2	17	85000			4	98333	0	p_2	17	86764		
5	93600			18	81500			5	94901			18	83332		
6	90400							6	91764						
7	87200			19	95500			7	88627			19	97057		
				20	92000							20	93626		
8	100300			21	88500			8	101764			21	90195		
9	96800			22	85000	645000	p_4	9	98333			22	86764	645000	p_4
10	93600	125000	p_3	23	81500			10	94901	125000	p_3	23	83332		
11	90400			24	78300			11	91764			24	79901		
12	87200			25	75100			12	88627			25	76764		
13	84000							13	85490			26	73627		

MOMENTS.

$$M_x = Rx - m.$$

Span, 52 feet.				Span, 53 feet.				Span, 54 feet.				Span, 55 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	109903			1	111132			1	112314			1	113451		
2	106538			2	107830			2	109074			2	110272		
3	103173			3	104528			3	105833			3	107090		
4	99807	0	p_2	4	101226	0	p_2	4	102592	0	p_2	4	103909	0	p_2
5	96442			5	97924			5	99351			5	100727		
6	93076			6	94622			6	96111			6	97545		
7	90000			7	91320			7	92870			7	94363		
8	103173			8	104528			8	105833			8	107090		
9	99807			9	101226			9	102592			9	103909		
10	96442	125000	p_3	10	97924	125000	p_3	10	99351	125000	p_3	10	100727	125000	p_3
11	93076			11	94622			11	96111			11	97545		
12	90000			12	91320			12	92870			12	94363		
13	86923			13	88301			13	89629			13	91181		
14	98557			14	100000			14	101388			14	102727		
15	95192			15	96697			15	98147			15	99544		
16	91826	320000	p_3	16	93395	320000	p_3	16	94906	320000	p_3	16	96362	320000	p_3
17	88461			17	90093			17	91665			17	93181		
18	85095			18	86791			18	88425			18	90000		
19	81730			19	83489			19	85184			19	86817		
								20	81943			20	83635		
20	95192			20	96697										
21	91826			21	93395			21	94906			21	96362		
22	88461	645000	p_4	22	90093	645000	p_4	22	91665	645000	p_4	22	93181	645000	p_4
23	85095			23	86791			23	88425			23	90000		
24	81730			24	83489			24	85184			24	86817		
25	78364			25	80187			25	81943			25	83635		
26	75288			26	76885			26	78702			26	80454		
				27	73867			27	75462			27	77272		
												28	74090		

Span, 56 feet.				Span, 56 feet.				Span, 56 feet.				Span, 56 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	115000			8	108303			14	104285			21	97767		
2	111428			9	105178			15	100892			22	94642		
3	108303			10	102053			16	97767			23	91517		
4	105178	0	p_2	11	98928	125000	p_3	17	94642	320000	p_3	24	88392	645000	p_4
5	102053			12	95803			18	91517			25	85267		
6	98928			13	92678			19	88392			26	82142		
7	95803							20	85267			27	79017		
												28	75892		

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 57 feet.				SPAN, 58 feet.				SPAN, 59 feet.				SPAN, 60 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	116491			1	117931			1	119322			1	120666		
2	112983			2	114483			2	115932			2	117333		
3	109475			3	111034			3	112542			3	114000		
4	106405	0	p_2	4	107586	0	p_2	4	109152	0	p_2	4	110666	0	p_2
5	103335			5	104569			5	105762			5	107333		
6	100265			6	101552			6	102796			6	104000		
7	97195			7	98534			7	99830			7	101083		
8	109475			8	111034			8	112542			8	114000		
9	106405			9	107586			9	109152			9	110666		
10	103335	125000	p_3	10	104569	125000	p_3	10	105762	125000	p_3	10	107333	125000	p_3
11	100265			11	101552			11	102796			11	104000		
12	97195			12	98534			12	99830			12	101083		
13	94124			13	95517			13	96864			13	98166		
14	105790			14	107241			14	108643			14	110000		
15	102457			15	103965			15	105423			15	106833		
16	99124			16	100689			16	102203			16	103666		
17	96054	320000	p_3	17	97413	320000	p_3	17	98983	320000	p_3	17	100500	320000	p_3
18	92984			18	94396			18	95761			18	97333		
19	89914			19	91379			19	92796			19	94166		
20	86843			20	88361			20	89830			20	91250		
21	83773			21	85345			21	86864			21	88333		
22	96054			22	97413			22	98983			22	100500		
23	92984			23	94396			23	95761			23	97333		
24	89914			24	91379			24	92796			24	94166		
25	86843	645000	p_4	25	88361	645000	p_4	25	89830	645000	p_4	25	91250	645000	p_4
26	83773			26	85345			26	86864			26	88333		
27	80703			27	82327			27	83897			27	85416		
28	77633			28	79309			28	80931			28	82500		
29	74563			29	76293			29	77965			29	79583		
								30	74500			30	76666		

MOMENTS.

$$M_x = Rx - m.$$

Span, 61 feet.				Span, 62 feet.				Span, 63 feet.				Span, 64 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	122377			1	124032			1	125634			1	127187		
2	118688			2	120403			2	122063			2	123671		
3	115409			3	116774			3	118492			3	120156		
4	112131	0	p_2	4	113548	0	p_2	4	114920	0	p_2	4	116640	0	p_2
5	108852			5	110322			5	111746			5	113125		
6	105573			6	107096			6	108571			6	110000		
7	102295			7	103870			7	105396			7	106875		
8	115409			8	116774			8	118492			8	120156		
9	112131			9	113548			9	114920			9	116640		
10	108852	125000	p_3	10	110322	125000	p_3	10	111746	125000	p_3	10	113125	125000	p_3
11	105573			11	107096			11	108571			11	110000		
12	102295			12	103870			12	105396			12	106875		
13	99426			13	100644			13	102222			13	103750		
14	111311			14	112580			14	113808			14	115390		
15	108196			15	109516			15	110792			15	112031		
16	105081			16	106451			16	107777			16	109061		
17	101966	320000	p_3	17	103386	320000	p_3	17	104761	320000	p_3	17	106093	320000	p_3
18	98851			18	100322			18	101745			18	103124		
19	95737			19	97257			19	98729			19	100156		
20	92622			20	94193			20	95713			20	97188		
21	89753			21	91128			21	92698			21	94219		
22	101966			22	103386			22	104761			22	106093		
23	98851			23	100322			23	101745			23	103124		
24	95737			24	97257			24	98729			24	100156		
25	92622			25	94193			25	95713			25	97188		
26	89753	645000	p_4	26	91128	645000	p_4	26	92698	645000	p_4	26	94219	645000	p_4
27	86885			27	88365			27	89682			27	91250		
28	84016			28	85483			28	86904			28	88281		
29	81148			29	82660			29	84126			29	85546		
30	78279			30	79837			30	81348			30	82812		
31	75410			31	77015			31	78570			31	80078		
								32	75792			32	77343		

MOMENTS.

$$M_x = Rx - m.$$

Span, 65 feet.				Span, 66 feet.				Span, 67 feet.				Span, 68 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	128692			1	130530			1	132313			1	134044		
2	125231			2	126742			2	128582			2	130367		
3	121769			3	123333			3	124850			3	126691		
4	118308	0	p_2	4	119924	0	p_2	4	121492	0	p_2	4	123014	0	p_2
5	114846			5	116515			5	118134			5	119706		
6	111385			6	113106			6	114776			6	116398		
7	108308			7	109696			7	111417			7	113089		
8	121769			8	123333			8	124850			8	126691		
9	118308			9	119924			9	121492			9	123014		
10	114846	125000		10	116515	125000		10	118134	125000		10	119706	125000	
11	111385		p_3	11	113106		p_3	11	114776		p_3	11	116398		p_3
12	108308			12	109696			12	111417			12	113089		
13	105230			13	106666			13	108059			13	109780		
14	116923			14	118408			14	119850			14	121250		
15	113615			15	115151			15	116641			15	118088		
16	110307			16	111893			16	113432			16	114927		
17	107384	320000		17	108635	320000		17	110223	320000		17	111765	320000	
18	104461		p_3	18	105756		p_3	18	107014		p_3	18	108603		p_3
19	101538			19	102878			19	104178			19	105441		
20	98614			20	100000			20	101342			20	102647		
21	95691			21	97119			21	98506			21	99853		
22	92769			22	94241			22	95671			22	97055		
23	104461			23	105756			23	107014			23	108603		
24	101538			24	102878			24	104178			24	105441		
25	98614			25	100000			25	101342			25	102647		
26	95691			26	97119			26	98506			26	99853		
27	92769	645000		27	94241	645000		27	95671	645000		27	97055	645000	
28	89847		p_4	28	91363		p_4	28	92835		p_4	28	94220		p_4
29	86924			29	88484			29	90000			29	91471		
30	84232			30	85705			30	87163			30	88656		
31	81538			31	82954			31	84327			31	85863		
32	78845			32	80302			32	81715			32	83068		
33	89847	1095000	p_5	33	91363	1095000	p_5	33	92835	1095000	p_3	33	94220	1095000	p_5
								34	90000			34	91471		

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MOMENTS.

$$M_x = Rx - m.$$

Span, 69 feet.				Span, 70 feet.				Span, 71 feet.				Span, 72 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	135724			1	137357			1	139295			1	141180		
2	132101			2	133785			2	135422			2	137361		
3	128478			3	130214			3	131901			3	133541		
4	124855	0	p_2	4	126642	0	p_2	4	128380	0	p_2	4	130070	0	p_2
5	121231			5	123071			5	124859			5	126600		
6	117971			6	119500			6	121338			6	123129		
7	114710			7	116285			7	117816			7	119658		
8	128478			8	130214			8	131901			8	133541		
9	124855			9	126642			9	128380			9	130070		
10	121231	125000	p_3	10	123071	125000	p_3	10	124859	125000	p_3	10	126600	125000	p_3
11	117971			11	119500			11	121338			11	123129		
12	114710			12	116285			12	117816			12	119658		
13	111449			13	113071			13	114646			13	116187		
14	122970			14	124641			14	126264			14	127853		
15	119492			15	121212			15	122882			15	124520		
16	116375			16	117784			16	119501			16	121187		
17	113260	320000	p_3	17	114712	320000	p_3	17	116118	320000	p_3	17	117853	320000	p_3
18	110144			18	111641			18	113090			18	114520		
19	107028			19	108570			19	110062			19	111534		
20	103912			20	105500			20	107035			20	108547		
21	101158			21	102427										
								21	119501			21	121187		
22	113260			22	114712			22	116118			22	117853		
23	110144			23	111641			23	113090			23	114520		
24	107028			24	108570			24	110062			24	111534		
25	103912			25	105500			25	107035			25	108547		
26	101158	645000	p_4	26	102427	645000	p_4	26	104006	645000	p_4	26	105562	645000	p_4
27	98405			27	99713			27	100978			27	102576		
28	95652			28	97000			28	98302			28	99589		
29	92897			29	94284			29	95626			29	96951		
30	90144			30	91570			30	92949			30	94312		
31	87390			31	88857			31	90274			31	91672		
32	84637			32	86143			32	87598			32	89039		
				33	83428			33	84921			33	86395		
33	95652														
34	92897	1095000	p_5	34	94284	1095000	p_5	34	95626	1095000	p_5	34	96951	1095000	p_5
35	90144			35	91570			35	92949			35	94312		
								36	90274			36	91672		

MOMENTS.

$$M_x = Rx - m.$$

Span, 73 feet.				Span, 74 feet.				Span, 75 feet.				Span, 76 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	143013			1	144797			1	146533			1	148223		
2	139246			2	141081			2	142866			2	144605		
3	135479			3	137365			3	139200			3	140986		
4	131712	0	p_2	4	133649	0	p_2	4	135533	0	p_2	4	137368	0	p_2
5	128287			5	129933			5	131866			5	133750		
6	124863			6	126555			6	128200			6	130131		
7	121438														
				7	141081			7	142866			7	144605		
8	135479			8	137365			8	139200			8	140986		
9	131712			9	133649			9	135533			9	137368		
10	128287	125000	p_3	10	129933	125000	p_3	10	131866	125000	p_3	10	133750	125000	p_3
11	124863			11	126555			11	128200			11	130131		
12	121438			12	123176			12	124866			12	126513		
13	118013			13	119798			13	121533			13	123223		
14	129383			14	131216			14	133000			14	134776		
15	126095			15	127635			15	129466			15	131249		
16	122807	320000	p_3	16	124391	320000	p_3	16	125933	320000	p_3	16	127762	320000	p_3
17	119520			17	121148			17	122733			17	124266		
18	116232			18	117904			18	119533			18	121118		
19	112945			19	114661			19	116333			19	117959		
20	110000			20	111418										
								20	129466			20	131249		
21	122807			21	124391			21	125933			21	127762		
22	119520			22	121148			22	122733			22	124266		
23	116232			23	117904			23	119533			23	121118		
24	112945			24	114661			24	116333			24	117959		
25	110000			25	111418			25	113133			25	114802		
26	107054	645000	p_4	26	108513	645000	p_4	26	109933	645000	p_4	26	111644	645000	p_4
27	104108			27	105607			27	107066			27	108486		
28	101164			28	102701			28	104200			28	105657		
29	98218			29	99797			29	101333			29	102828		
30	95616			30	96891			30	98466			30	100000		
31	93012			31	94323			31	95600			31	97170		
32	90410			32	91756			32	93066						
33	87807			33	89188							32	108486		
								33	104200			33	105657		
34	98218			34	99797			34	101333			34	102828		
35	95616			35	96891			35	98466			35	100000		
36	93012	1095000	p_5	36	94323	1095000	p_5	36	95600	1095000	p_5	36	97170	1095000	p_5
37	90410			37	91756			37	93066			37	94341		
								38	90533			38	91841		

MOMENTS.

$$M_x = Rx - m.$$

Span, 77 feet.				Span, 78 feet.				Span, 79 feet.				Span, 80 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	149870			1	151666			1	153417			1	155125		
2	146298			2	147948			2	149746			2	151500		
3	142727			3	144423			3	146075			3	147875		
4	139155	0	p_2	4	140897	0	p_2	4	142594	0	p_2	4	144250	0	p_2
5	135584			5	137371			5	139113			5	140812		
6	132013			6	133845			6	135632			6	137375		
7	128442			7	130319			7	132151			7	133937		
8	142727			8	144423			8	146075			8	147875		
9	139155			9	140897			9	142594			9	144250		
10	135584	125000	p_3	10	137371	125000	p_3	10	139113	125000	p_3	10	140812	125000	p_3
11	132013			11	133845			11	135632			11	137375		
12	128442			12	130319			12	132151			12	133937		
13	124871			13	126793			13	128670			13	130500		
14	136429			14	138074			14	140000			14	141874		
15	132987			15	134677			15	136328			15	138250		
16	129545	320000	p_3	16	131280	320000	p_3	16	132974	320000	p_3	16	134624	320000	p_3
17	126104			17	127882			17	129620			17	131312		
18	122662			18	124484			18	126265			18	128000		
19	119546			19	121088										
								19	140000			19	141874		
20	132987			20	134677			20	136328			20	138250		
21	129545			21	131280			21	132974			21	134624		
22	126104			22	127882			22	129620			22	131312		
23	122662			23	124484			23	126265			23	128000		
24	119546			24	121088	645000	p_4	24	122910	645000	p_4	24	124687	645000	p_4
25	116429	645000	p_4	25	118010			25	119556			25	121374		
26	113312			26	114933			26	116518			26	118062		
27	110195			27	111857			27	113480			27	115062		
28	107077			28	108780			28	110442			28	112062		
29	104286			29	105702			29	107404						
30	101494											29	124687		
				30	118010			30	119556			30	121374		
31	113312			31	114933			31	116518			31	118062		
32	110195			32	111857			32	113480			32	115062		
33	107077			33	108780			33	110442			33	112062		
34	104286			34	105702	1095000	p_5	34	107404	1095000	p_5	34	109062	1095000	p_5
35	101494	1095000	p_5	35	102946			35	104366			35	106062		
36	98701			36	100190			36	101644			36	103062		
37	95909			37	97433			37	98923			37	100375		
38	93116			38	94677			38	96201			38	97687		
39	90650			39	91923			39	93480			39	95000		
								40	90759			40	92312		

MOMENTS.

$$M_x = Rx - m.$$

Span, 81 feet.				Span, 82 feet.				Span, 83 feet.				Span, 84 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	156790			1	158414			1	160180			1	161904		
2	153209			2	154878			2	156506			2	158273		
3	149629			3	151341			3	153012			3	154642		
4	146049	0	p_2	4	147804	0	p_2	4	149518	0	p_2	4	151190	0	p_2
5	142469			5	144268			5	146024			5	147738		
6	139074			6	140731			6	142530			6	144285		
7	135679			7	137378			7	139036			7	140833		
8	149629			8	151341			8	153012			8	154642		
9	146049			9	147804			9	149518			9	151190		
10	142469	125000	p_3	10	144268	125000	p_3	10	146024	125000	p_3	10	147738	125000	p_3
11	139074			11	140731			11	142530			11	144285		
12	135679			12	137378			12	139036			12	140833		
13	132283			13	134024			13	135722			13	137380		
14	143702			14	145487			14	147228			14	148938		
15	140122			15	141951			15	143734			15	145475		
16	136542	320000	p_3	16	138414	320000	p_3	16	140239	320000	p_3	16	142023	320000	p_3
17	132962			17	134877			17	136746			17	138570		
18	129691			18	131314			18	133251			18	135118		
19	143702			19	145487			19	147228			19	148938		
20	140122			20	141951			20	143734			20	145475		
21	136542			21	138414			21	140239			21	142023		
22	132962			22	134877			22	136746			22	138570		
23	129691			23	131341			23	133251			23	135118		
24	126418	645000	p_4	24	128109	645000	p_4	24	129757	645000	p_4	24	131666	645000	p_4
25	123147			25	124877			25	126564			25	128214		
26	119876			26	121645			26	123372			26	125059		
27	116604			27	118413										
28	113641							27	136746			27	138570		
				28	131341			28	133251			28	135118		
29	126418			29	128109			29	129757			30	128214		
30	123147			30	124877			30	126564			32	121903		
31	119876			31	121645			32	120179	1095000	p_5	34	115594	1095000	p_5
32	116604			32	118413			34	113794			35	112440		
33	113641			33	115182			36	108010			36	109582		
34	110678			34	112255			38	102227			37	106726		
35	107715	1095000	p_5	35	109328	1095000	p_5								
36	104752			36	106401										
37	101789			37	103475										
38	99135			38	100548			39	120179	1900000	p_6	38	125059	1900000	p_6
39	96481			39	97926							39	121903		
40	93826			40	95304										
41	91172			41	92682										
								40	133251	2550000	p_7	40	135118	2550000	p_7
								41	129757			41	131666		
								42	126564			42	128214		

MOMENTS.

$$M_x = Rx - m.$$

Span, 85 feet.				Span, 86 feet.				Span, 87 feet.				Span, 88 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	163588			1	165232			1	166839			1	168579		
2	160000			2	161685			2	163333			2	164943		
3	156412			3	158139			3	159827			3	161477		
4	152824	0	p_2	4	154593	0	p_2	4	156321	0	p_2	4	158011	0	p_2
5	149412			5	151046			5	152816			5	154545		
6	146000			6	147674			6	149310			6	151079		
7	142588			7	144302			7	145977			7	147613		
8	156412			8	158139			8	159827			8	161477		
9	152824			9	154593			9	156321			9	158011		
10	149412	125000		10	151046	125000		10	152816	125000		10	154545	125000	
11	146000		p_3	11	147674		p_3	11	149310		p_3	11	151079		p_3
12	142588			12	144302			12	145977			12	147613		
13	139177			13	140930			13	142643			13	144317		
14	150587			14	152383			14	154137			14	155951		
15	147175			15	148837			15	150632			15	152386		
16	143763	320000		16	145464	320000		16	147125	320000		16	148919	320000	
17	140351		p_3	17	142092		p_3	17	143792		p_3	17	145454		p_3
18	136939			18	138720			18	140458			18	142158		
19	133528			19	135348			19	137125			19	138863		
20	147175			20	148837			20	150632			20	152386		
21	143763			21	145464			21	147125			21	148919		
22	140351			22	142092			22	143792			22	145454		
23	136939	645000		23	138720	645000		23	140458	645000		23	142158	645000	
24	133528		p_4	24	135348		p_4	24	137125		p_4	24	138863		p_4
25	130115			25	131976			25	133793			25	135567		
26	126704			26	128604			26	130459			26	132272		
								27	127126			27	128976		
27	140351			27	142092										
28	136939			28	138720			28	140458			28	142158		
29	133528			29	135348			29	137125			29	138863		
30	130115	1095000		30	131976	1095000		30	133793	1095000		30	135567	1095000	
31	126704		p_5	31	128604		p_5	31	130459		p_5	31	132272		p_5
32	123586			32	125232			32	127126			32	128976		
33	120469			33	122150			33	123792			33	125680		
34	117351			34	119068			34	120746			34	122385		
35	114233			35	115986			35	117701			35	119373		
36	133528			36	135348			36	137125			36	138863		
37	130115	1900000		37	131976	1900000		37	133793	1900000		37	135567	1900000	
38	126704		p_6	38	128604		p_6	38	130459		p_6	38	132272		p_6
								39	127126			39	128976		
39	140351			39	142092										
40	136939			40	138720			40	140458			40	142158		
41	133528	2550000		41	135348	2550000		41	137125	2550000		41	138863	2550000	
42	130115		p_7	42	131976		p_7	42	133793		p_7	42	135567		p_7
43	126704			43	128604			43	130459			43	132272		
								44	127126			44	128976		

MOMENTS.

$$M_x = Rx - m.$$

Span, 89 feet.				Span, 89 feet.				Span, 90 feet.				Span, 90 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	170280			40	143819			1	171943			40	145610		
2	166685			41	140561			2	168388			41	142222		
3	163089			42	137303	2550000	p_7	3	164832			42	139000	2550000	p_7
4	159662	0	p_2	43	134044			4	161277	0	p_2	43	135777		
5	156235			44	130786			5	157888			44	132555		
6	152808							6	154500						
7	149382							7	151110						
8	163089			45	143819	3275000	p_8	8	164832			45	145610	3275000	p_8
9	159662							9	161277						
10	156235	125000	p_3					10	157888	125000	p_3				
11	152808							11	154500						
12	149382							12	151110						
13	145955							13	147721						
14	157527							14	159166						
15	154100							15	155776						
16	150673	320000	p_3					16	152388	320000	p_3				
17	147246							17	149000						
18	143819							18	145610						
19	140561							19	142222						
20	154100							20	155776						
21	150673							21	152388						
22	147246							22	149000						
23	143819	645000	p_4					23	145610	645000	p_4				
24	140561							24	142222						
25	137303							25	139000						
26	134044							26	135777						
27	130786							27	132555						
28	143819							28	145610						
29	140561							29	142222						
30	137303							30	139000						
31	134044	1095000	p_5					31	135777	1095000	p_5				
32	130786							32	132555						
33	127527							33	129333						
34	124269							34	126110						
35	121010							35	122888						
36	140561							36	142222						
37	137303							37	139000						
38	134044	1900000	p_6					38	135777	1900000	p_6				
39	130786							39	132555						

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 91 feet.				SPAN, 91 feet.				SPAN, 92 feet.				SPAN, 92 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	173571			28	147361			1	175163			28	149075		
2	170054			29	144011			2	171684			29	145760		
3	166538			30	140660			3	168206			30	142444		
4	163021	0	p_2	31	137473	1095000	p_5	4	164728	0	p_2	31	139129	1095000	p_5
5	159505			32	134286			5	161250			32	135977		
6	156153			33	131100			6	157771			33	132825		
7	152802			34	127912			7	154456			34	129673		
				35	124725							35	126521		
8	166538							8	168206						
9	163021			36	144011			9	164728			36	145760		
10	159505	125000	p_3	37	140660	1900000	p_6	10	161250	125000	p_3	37	142444	1900000	p_6
11	156153			38	137473			11	157771			38	139129		
12	152802			39	134286			12	154456			39	135977		
13	149450							13	151141						
				40	147361							40	149075		
14	160933			41	144011			14	162662			41	145760		
15	157417			42	140660	2550000	p_7	15	159183			42	142444	2550000	p_7
16	154065	320000	p_3	43	137473			16	155705	320000	p_3	43	139129		
17	150713			44	134286			17	152390			44	135977		
18	147361							18	149075						
19	144011							19	145760						
				45	147361	3275000	p_8					45	149075	3275000	p_8
20	157417			46	144011			20	159183			46	145760		
21	154065							21	155705						
22	150713							22	152390						
23	147361	645000	p_4					23	149075	645000	p_4				
24	144011							24	145760						
25	140660							25	142444						
26	137473							26	139129						
27	134286							27	135977						

MOMENTS.

$$M_x = Rx - m.$$

Span, 93 feet.				Span, 93 feet.				Span, 94 feet.				Span, 94 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	176881			28	150752			1	178563			28	152392		
2	173279			29	147472			2	175000			29	149147		
3	169838			30	144192			3	171436			30	145902		
4	166397	0	p_2	31	140913	1095000	p_5	4	168031	0	p_2	31	142658	1095000	p_5
5	162956			32	137634			5	164627			32	139413		
6	159516			33	134516			6	161223			33	136168		
7	156075			34	131397			7	157819			34	133083		
				35	128279							35	130000		
				36	125161							36	126913		
8	169838							8	171436						
9	166397							9	168031						
10	162957	125000	p_3	37	144192	1900000	p_6	10	164627	125000	p_3	37	145902	1900000	p_6
11	159516			38	140913			11	161223			38	142658		
12	156075			39	137634			12	157819			39	139413		
13	152795			40	134516			13	154414			40	136168		
14	164354			41	147472			14	166010			41	149147		
15	160913			42	144192			15	162605			42	145902		
16	157472	320000	p_3	43	140913	2550000	p_7	16	159201	320000	p_3	43	142658	2550000	p_7
17	154031			44	137634			17	155796			44	139413		
18	150752							18	152392						
19	147472							19	149147						
				45	150752	3275000	p_8					45	152392	3275000	p_8
				46	147472							46	149147		
20	160913			47	144192			20	162605			47	145902		
21	157472							21	159201						
22	154031							22	155796						
23	150752	645000	p_4					23	152392	645000	p_4				
24	147472							24	149147						
25	144192							25	145902						
26	140913							26	142658						
27	137634							27	139413						

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MOMENTS.

$$M_x = Rx - m.$$

Span, 95 feet.				Span, 95 feet.				Span, 96 feet.				Span, 96 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	180211			41	150788			1	181822			41	152552		
2	176684			42	147578			2	178333			42	149219		
3	173157			43	144367	2550000	p_7	3	174843			43	146042	2550000	p_7
4	169631	0	p_2	44	141157			4	171354	0	p_2	44	142865		
5	166263							5	167864						
6	162894			45	154157			6	164531			45	155885		
7	159526			46	150788	3275000	p_8	7	161197			46	152552	3275000	p_8
				47	147578							47	149219		
8	173157			48	144367			8	174843			48	146042		
9	169631							9	171354						
10	166263	125000	p_3					10	167864	125000	p_3				
11	162894							11	164531						
12	159526							12	161197						
13	156157							13	157864						
14	167631							14	169374						
15	164262							15	165884						
16	160894	320000	p_3					16	162551	320000	p_3				
17	157525							17	159218						
18	154157							18	155885						
19	150788							19	152552						
20	164262							20	165884						
21	160894							21	162551						
22	157525							22	159218						
23	154157	645000	p_4					23	155885	645000	p_4				
24	150788							24	152552						
25	147578							25	149219						
26	144367							26	146042						
27	141157							27	142865						
28	154157							28	155885						
29	150788							29	152552						
30	147578							30	149219						
31	144367							31	146042						
32	141157	1095000	p_5					32	142865	1095000	p_5				
33	137948							33	139689						
34	134738							34	136512						
35	131686							35	133335						
36	128634							36	130314						
37	147578							37	149219						
38	144367							38	146042						
39	141157	1900000	p_6					39	142865	1900000	p_6				
40	137948							40	139689						

MOMENTS.

$$M_x = Rx - m.$$

Span, 97 feet.				Span, 97 feet.				Span, 98 feet.				Span, 98 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	183525			41	150978			1	185193			41	155968		
2	179948			42	147679	2550000	p_7	2	181653			42	152703	2550000	p_7
3	176494			43	144535			3	178112			43	149438		
4	173041	0	p_2	44	141391			4	174693	0	p_2	44	146173		
5	169587							5	171275						
6	166134			45	157576			6	167857			45	159234		
7	162835			46	154278			7	164438			46	155968		
				47	150978	3275000	p_8					47	152703	3275000	p_8
8	176494			48	147679			8	178112			48	149438		
9	173041			49	144535			9	174693			49	146173		
10	169587	125000	p_3					10	171275	125000	p_3				
11	166134							11	167857						
12	162835							12	164438						
13	159536							13	161173						
14	171082							14	172754						
15	167628							15	169335						
16	164175	320000	p_3					16	165917	320000	p_3				
17	160875							17	162500						
18	157576							18	159234						
19	154278							19	155968						
20	167628							20	169335						
21	164175							21	165917						
22	160875							22	162500						
23	157576							23	159234						
24	154278	645000	p_4					24	155968	645000	p_4				
25	150978							25	152703						
26	147679							26	149438						
27	144535							27	146173						
28	157576							28	159234						
29	154278							29	155968						
30	150978							30	152703						
31	147679							31	149438						
32	144535	1095000	p_5					32	146173	1095000	p_5				
33	141391							33	143060						
34	138246							34	139948						
35	135102							35	136836						
36	132958							36	133724						
37	150978							37	152703						
38	147679							38	149438						
39	144535	1900000	p_6					39	146173	1900000	p_6				
40	141391							40	143060						

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 99 feet.				SPAN, 99 feet.				SPAN, 100 feet.				SPAN, 100 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	186828			41	157625	2550000	p_7	1	188430			41	159250	2550000	p_7
2	183323			42	154393			2	184960			42	156050		
3	179818			43	151160			3	181490			43	152850		
4	176313	0	p_2	44	147928			4	178020	0	p_2	44	149650		
5	172924							5	174550						
6	169545			45	160858	3275000	p_8	6	171200			45	162600	3275000	p_8
7	166161			46	157625			7	167850			46	159250		
8	179818			47	154393			8	181490			47	156050		
9	176313			48	151160			9	178020			48	152850		
10	172929	125000	p_3	49	147928			10	174550	125000	p_3	49	149650		
11	169545			50	144696			11	171200						
12	166161							12	167850			50	178020	4840000	p_{10}
13	162777							13	164500						
14	174393							14	176000						
15	171000							15	172650						
16	167625	320000	p_3					16	169300	320000	p_3				
17	164241							17	165950						
18	160858							18	162600						
19	157625							19	159250						
20	171009							20	172650						
21	167625							21	169300						
22	164241							22	165950						
23	160858	645000	p_4					23	162600	645000	p_4				
24	157625							24	159250						
25	154393							25	156050						
26	151160							26	152850						
27	147928														
28	160858							27	165950						
29	157625							28	162600						
30	154393							29	159250						
31	151160							30	156050						
32	147928	1095000	p_5					31	152850	1095000	p_5				
33	144696							32	149650						
34	141615							33	146450						
35	138534							34	143250						
36	135454							35	140200						
								36	137150						
37	154393							37	156050						
38	151160							38	152850						
39	147928	1900000	p_6					39	149650	1900000	p_6				
40	144696							40	146450						

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 103 feet.				SPAN, 103 feet.				SPAN, 105 feet.				SPAN, 105 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	193281			41	164368			1	196438			41	167619		
2	189796			42	161115			2	193019			42	164429		
3	186310			43	157963	2550000	p_7	3	189600			43	161234	2550000	p_7
4	182941	0	p_2	44	154611			4	186180	0	p_2	44	158048		
5	179572			45	151504			5	182761			45	154858		
6	176203							6	179457						
7	172834			46	164368			7	176152			46	167619		
				47	161115	3275000	p_8					47	164429	3275000	p_8
8	186310			48	157963			8	189600			48	161234		
9	182941			49	154611			9	186180			49	158048		
10	179572	125000	p_3					10	182761	125000	p_3				
11	176203			50	182941			11	179457			50	170952	4075000	p_9
12	172834			51	179572	4840000	p_{10}	12	176152						
13	169466			52	176203			13	172848			51	182761		
14	181067							14	184400			52	179457	4840000	p_{10}
15	177669							15	180953			53	176152		
16	174271							16	177619						
17	170873	320000	p_3					17	173286	320000	p_3				
18	167620							18	170952						
19	164368							19	167619						
20	177669							20	180953						
21	174271							21	177619						
22	170873							22	173286						
23	167620							23	170952						
24	164368	645000	p_4					24	167619	645000	p_4				
25	161115							25	164429						
26	157963							26	161234						
27	154611							27	158048						
28	167620							28	170952						
29	164368							29	167619						
30	161115							30	164429						
31	157963							31	161234						
32	154611	1095000	p_5					32	158048	1095000	p_5				
33	151504							33	154858						
34	148398							34	151668						
35	145290							35	148621						
36	142183							36	145574						
37	161115							37	164429						
38	157963							38	161234						
39	154611	1900000	p_6					39	158048	1900000	p_6				
40	151504							40	154858						

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 108 feet.				SPAN, 108 feet.				SPAN, 110 feet.				SPAN, 110 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	200953			41	172684			1	203827			41	176017		
2	197629			42	169443			2	200563			42	172726		
3	194305			43	166202	2550000	p_7	3	197300			43	169545	2550000	p_7
4	190981	0	p_2	44	162962			4	194036	0	p_2	44	166362		
5	187657			45	159861			5	190772			45	163181		
6	184333							6	187509						
7	181009			46	172684			7	184245			46	176017		
8	194305			47	169443	3275000	p_8	8	197300			47	172726	3275000	p_8
9	190981			48	166202			9	194036			48	169545		
10	187657	125000	p_3	49	162962			10	190772	125000	p_3	49	166362		
11	184333							11	187509						
12	181009			50	175925	4075000	p_9	12	184245			50	179308	4075000	p_9
13	177685			51	172684			13	180981			51	176017		
14	189333							14	192581						
15	185981							15	189181						
16	182629	320000	p_3	52	184333	4840000	p_{10}	16	185890	320000	p_3	52	187509	4840000	p_{10}
17	179277			53	181009			17	182599			53	184245		
18	175925			54	177685			18	179308			54	180981		
19	172684							19	176017						
20	185981							20	189181						
21	182629							21	185890						
22	179277							22	182599			55	203827	6240000	p_{11}
23	175925	645000	p_4					23	179308	645000	p_4				
24	172684							24	176017						
25	169443							25	172726						
26	166202							26	169545						
27	162962							27	166362						
28	175925							28	179308						
29	172684							29	176017						
30	169443							30	172726						
31	166202							31	169545						
32	162962	1095000	p_5					32	166362	1095000	p_5				
33	159861							33	163181						
34	156759							34	160000						
35	153657							35	156953						
36	150556							36	153908						
37	169443							37	172726						
38	166202							38	169545						
39	162962	1900000	p_6					39	166362	1900000	p_6				
40	159861							40	163181						

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 113 feet.				SPAN, 113 feet.				SPAN, 115 feet.				SPAN, 115 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	208159			41	180957			1	210991			37	180956		
2	204876			42	177753			2	207765			38	177809		
3	201592			43	174550	2550000	p_7	3	204539			39	174660	1900000	p_6
4	198415	0	p_2	44	171346			4	201313	0	p_2	40	171512		
5	195238			45	168144			5	198086			41	168364		
6	192061							6	194965						
7	188884			46	180957			7	191843			42	180956		
				47	177753	3275000	p_8					43	177809	2550000	p_7
8	201592			48	174550			8	204539			44	174660		
9	198415			49	171346			9	201313			45	171512		
10	195238	125000	p_3					10	198086	125000	p_3				
11	192061			50	184160			11	194965			46	184207		
12	188884			51	180957	4075000	p_9	12	191843			47	180956		
13	185707			52	177753			13	188721			48	177809	3275000	p_8
				53	174550							49	174660		
14	197397							14	200468			50	171512		
15	194088							15	197217						
16	190778			54	185707	4840000	p_{10}	16	193964			51	184207		
17	187470	320000	p_3					17	190712	320000	p_3	52	180956		
18	184160							18	187460			53	177809	4075000	p_9
19	180957							19	184207			54	174660		
20	194088			55	208159			20	197217						
21	190778			56	204876	6240000	p_{11}	21	193964						
22	187470			57	201592			22	190712			55	200468	5550000	p_{10}
23	184160							23	187460						
24	180957							24	184207						
25	177753	645000	p_4					25	180956	645000	p_4				
26	174550							26	177809						
27	171346							27	174660						
28	168144							28	171512						
29	180957							29	184207			56	207765		
30	177753							30	180956			57	204539	6240000	p_{11}
31	174550							31	177809			58	201313		
32	171346							32	174660						
33	168144	1095000	p_5					33	171512	1095000	p_5				
34	165046							34	168364						
35	161949							35	165216						
36	158852							36	162172						
37	177753														
38	174550														
39	171346	1900000	p_6												
40	168144														

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 120 feet.				SPAN, 120 feet.				SPAN, 125 feet.				SPAN, 125 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	218058			38	185883			1	225040			40	187424		
2	214866			39	182766			2	221880			41	184432		
3	211675			40	179650	1900000	p_6	3	218720			42	181440	1900000	p_6
4	208483	0	p_2	41	176533			4	215560	0	p_2	43	178448		
5	205291							5	212400						
6	202200			42	189000			6	209336			44	190416		
7	199108			43	185883			7	206272			45	187424		
				44	182766	2550000	p_7	8	203208			46	184432	2550000	p_7
8	211675			45	179650							47	181440		
9	208483			46	176533			9	215024	120000	p_2	48	178448		
10	205291	125000	p_3												
11	202200			47	189000							49	190416		
12	199108			48	185883			10	212400			50	187424		
13	196016			49	182766	3275000	p_8	11	209336			51	184432	3275000	p_8
				50	179650			12	206272	125000	p_3	52	181440		
14	207800			51	176533			13	203208			53	178448		
15	204583														
16	201466			52	189000			14	215024			54	190416		
17	198350			53	185883			15	211840			55	187424		
18	195233	320000	p_3	54	182766	4075000	p_9	16	208752			56	184432	4075000	p_9
19	192116			55	179650			17	205664			57	181440		
20	189000			56	176533			18	202576	320000	p_3				
								19	199488						
21	201466							20	196400			58	205664		
22	198350			57	201466			21	193408			59	202576		
23	195233			58	198350	5650000	p_{10}					60	199488	5650000	p_{10}
24	192116	645000	p_4					22	205664						
25	189000							23	202576						
26	185883							24	199488			61	206272		
27	182766			59	205291			25	196400			62	203208	6240000	p_{11}
28	179650			60	202200	6240000	p_{11}	26	193408	645000	p_4				
								27	190416						
29	192116							28	187424						
30	189000							29	184432						
31	185883							30	181440						
32	182766											63	215024		
33	179650							31	193408					7170000	p_{11}
34	176533							32	190416						
35	173416	1095000	p_5					33	187424						
36	170389							34	184432						
37	167372							35	181440						
								36	178448	1095000	p_5				
								37	175456						
								38	172464						
								39	169472						

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 130 feet.				SPAN, 130 feet.				SPAN, 135 feet.				SPAN, 135 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	231946			40	194783			1	238429			40	202042		
2	228815			41	191813			2	235414			41	199094		
3	225684			42	188844	1900000	p_6	3	232400			42	196146	1900000	p_6
4	222553			43	185968			4	229385			43	193287		
5	219422	0	p_2	44	183090			5	226370	0	p_2	44	190428		
6	216383							6	223354			45	187568		
7	213345			45	194783			7	220339						
8	210306			46	191813			8	217324			46	199094		
				47	188844	2550000	p_7					47	196146		
9	222152			48	185968			9	228498			48	193287	2550000	p_7
10	218998	120000	p_2	49	183090			10	226072	120000	p_2	49	190428		
11	215936							11	223035			50	187568		
				50	194783			12	219998						
12	213345	125000	p_3	51	191813			13	216961			51	199094		
13	210306			52	188844	3275000	p_8					52	196146		
				53	185968			14	228498			53	193287	3275000	p_8
14	222152			54	183090			15	226072			54	190428		
15	218998							16	223035			55	187568		
16	215936			55	194783			17	219998						
17	212875			56	191813			18	216961			56	199094		
18	209814	320000	p_3	57	188844	4075000	p_9	19	213924			57	196146		
19	206752			58	185968			20	210887	320000	p_3	58	193287	4075000	p_9
20	203690							21	207939			59	190428		
21	200721			59	209814										
				60	206752			22	219998			60	213924		
22	212875			61	203690	5650000	p_{10}	23	216961			61	210887		
23	209814							24	213924			62	207939	5650000	p_{10}
24	206752							25	210887			63	204991		
25	203690			62	210306	6240000	p_{11}	26	207939	645000	p_4				
26	200721	645000	p_4					27	204991			64	226072		
27	197752							28	202042			65	223035		
28	194783			63	222152			29	199094			66	219998	7170000	p_{11}
29	191813			64	218998			30	196146			67	216961		
30	188844			65	215936	7170000	p_{11}					68	213924		
								31	207939						
31	200721							32	204991						
32	197752							33	202042						
33	194783							34	199094						
34	191813							35	196146						
35	188844	1095000	p_5					36	193287	1095000	p_5				
36	185968							37	190428						
37	183090							38	187568						
38	180214							39	184708						
39	177326														

LIBRARY OF THE UNIVERSITY OF CALIFORNIA.

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 140 feet.				SPAN, 140 feet.				SPAN, 145 feet.				SPAN, 145 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	244792			41	206285			1	251131			41	213391		
2	241800			42	203356			2	248158			42	210481		
3	238807			43	200514	1900000	p_6	3	245186			43	207653	1900000	p_6
4	235814			44	197671			4	242213			44	204825		
5	232821	0	p_2	45	194827			5	239241	0	p_2	45	201998		
6	229914							6	236351						
7	227007			46	206285			7	233461			46	213391		
8	224100			47	203356			8	230571			47	210481		
				48	200514	2550000	p_7					48	207653	2550000	p_7
9	236084			49	197671			9	242578			49	204825		
10	233070	120000	p_2	50	194827			10	239585	120000	p_2	50	201998		
11	230056							11	236674						
12	227042			51	206285			12	233764			51	213391		
13	224028			52	203356			13	230853			52	210481		
				53	200514	3275000	p_8					53	207653	3275000	p_8
14	236084			54	197671			14	242578			54	204825		
15	233070			55	194827			15	239585			55	201998		
16	230056							16	236674			56	199170		
17	227042	320000	p_3	56	206285			17	233764	320000	p_3				
18	224028			57	203356			18	230853			57	210481		
19	221014			58	200514	4075000	p_9	19	227943			58	207653	4075000	p_9
20	218000			59	197671			20	225032			59	204825		
21	215070			60	194827			21	222122			60	201998		
22	227042							22	219211						
23	224028			61	218000			23	230853			61	225032		
24	221014			62	215070	5650000	p_{10}	24	227943			62	222122	5650000	p_{10}
25	218000			63	212142			25	225032			63	219211		
26	215070		p_4					26	222122		p_4	64	216301		
27	212142	645000		64	233070			27	219211	645000		65	213391		
28	209213			65	230056			28	216301						
29	206285			66	227042			29	213391			66	233764		
30	203356			67	224028	7170000	p_{11}	30	210481			67	230853		
				68	221014			31	207653			68	227943		
31	215070			69	218000							69	225032	7170000	p_{11}
32	212142			70	215070			32	219211			70	222122		
33	209213							33	216301			71	219211		
34	206285							34	213391			72	216301		
35	203356							35	210481			73	213391		
36	200514	1095000	p_5					36	207653	1095000	p_5				
37	197671							37	204825						
38	194827							38	201998						
39	191985							39	199170						
40	189142							40	196343						

MOMENTS.

$$M_x = Rx - m.$$

Span, 150 feet.				Span, 150 feet.				Span, 155 feet.				Span, 155 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	257446			42	217533			1	263741			43	221403		
2	254493			43	214720			2	260806			44	218681		
3	251540			44	211906	1900000	p_6	3	257870			45	215958	1900000	p_6
4	248586			45	209093			4	254935			46	213236		
5	245633	0	p_2	46	206280			5	252000	0	p_2	47	210515		
6	242760							6	249141						
7	239866			47	217533			7	246283			48	221403		
8	237013			48	214720			8	243425			49	218681		
				49	211906	2550000	p_7					50	215958	2550000	p_7
9	249040			50	209093			9	255470			51	213236		
10	246066			51	206280			10	252515			52	210515		
11	243173	120000	p_2					11	249638	120000	p_2	53	207793		
12	240280			52	217533			12	246761						
13	237386			53	214720			13	243883			54	218681		
				54	211906	3275000	p_8					55	215958		
14	249040			55	209093			14	255470			56	213236	3275000	p_8
15	246066			56	206280			15	252515			57	210515		
16	243173							16	249638			58	207793		
17	240280			57	217533			17	246761						
18	237386	320000	p_3	58	214720			18	243883	320000	p_3	59	218681		
19	234493			59	211906			19	241006			60	215958		
20	231600			60	209093	4075000	p_9	20	238128			61	213236	4075000	p_9
21	228786			61	206280			21	235328			62	210515		
22	225973			62	203466			22	232528			63	207793		
23	237386							23	243883						
24	234493			63	225973			24	241006			64	229727		
25	231600			64	223160			25	238128			65	226926		
26	228786			65	220346	5650000	p_{10}	26	235328			66	224126	5650000	p_{10}
27	225973	645000	p_4	66	217533			27	232528	645000	p_4	67	221403		
28	223160			67	214720			28	229727			68	218681		
29	220346							29	226926						
30	217533			68	234493			30	224126			69	238128		
31	214720			69	231600			31	221403			70	235328		
				70	228786			32	218681			71	232528		
32	225973			71	225973	7170000	p_{11}					72	229727	7170000	p_{11}
33	223160			72	223160			33	229727			73	226926		
34	220346			73	220346			34	226926			74	224126		
35	217533			74	217533			35	224126			75	221403		
36	214720			75	214720			36	221403			76	218681		
37	211906							37	218681			77	215958		
38	209093	1095000	p_5					38	215958	1095000	p_5	78	213236		
39	206280							39	213236						
40	203466							40	210515						
41	200733							41	207793						
								42	205070						

MOMENTS.

$$M_x = Rx - m.$$

Span, 160 feet.				Span, 160 feet.				Span, 160 feet.				Span, 165 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	269725			39	219829			75	227967			1	275624		
2	266881			40	217116			76	225254			2	272793		
3	264037			41	214486	1095000	p_5	77	222541	7170000	p_{11}	3	269963		
4	261193	0	p_2	42	211849			78	219829			4	267133		
5	258350							79	217116			5	264303	0	p_2
6	255506			43	227967							6	261545		
7	252662			44	225254							7	258787		
8	249818			45	222541			80	227967	8245000	p_{12}	8	256030		
				46	219829	1900000	p_6								
9	261880			47	217116							9	268181		
10	258942			48	214486							10	265333		
11	256079	120000	p_2									11	262484		
12	253197			49	225254							12	259636	120000	p_2
13	250354			50	222541							13	256787		
				51	219829							14	253938		
14	261880			52	217116	2550000	p_7								
15	258942			53	214486							15	265333		
16	256079			54	211849							16	262484		
17	253197											17	259636		
18	250354	320000	p_3	55	222541							18	256787		
19	247491			56	219829							19	253938	320000	p_3
20	244628			57	217116	3275000	p_8					20	251089		
21	241840			58	214486							21	248313		
22	239053			59	211849							22	245537		
23	236255			60	209212							23	242761		
24	247491			61	219829							24	253938		
25	244628			62	217116	4075000	p_9					25	251089		
26	241840			63	214486							26	248313		
27	239053	645000	p_4	64	211849							27	245537		
28	236255											28	242761	645000	p_4
29	233467			65	233467							29	239986		
30	230680			66	230680	5650000	p_{10}					30	237211		
31	227967			67	227967							31	234507		
32	225254			68	225254							32	231804		
33	236255			69	244628							33	242761		
34	233467			70	241840							34	239986		
35	230680	1095000	p_5	71	239053	7170000	p_{11}					35	237211		
36	227967			72	236255							36	234507	1095000	p_5
37	225254			73	233467							37	231804		
38	222541			74	230680							38	229101		

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 165 feet.				SPAN, 165 feet.				SPAN, 170 feet.				SPAN, 170 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
39	226397	1095000	p_5	76	231804	7170000	p_{11}	1	281535	0	p_2	40	230235	1095000	p_5
40	223696			77	229101			2	278717			41	227611		
41	221072			78	226397			3	275900			42	224987		
42	218447			79	223696			4	273082			43	222364		
43	215823			80	221072			5	270264						
								6	267517						
								7	264770			44	238317		
44	231804	1900000	p_6	81	231804	8245000	p_{12}	8	262023			45	235624	1900000	p_6
45	229101			82	229101							46	232929		
46	226397			83	226397			9	274188	120000	p_2	47	230235		
47	223696							10	271353			48	227611		
48	221072							11	268687						
								12	265823						
49	231804	2550000	p_7					13	263059			49	238317	2550000	p_7
50	229101							14	260294			50	235624		
51	226397											51	232929		
52	223696							15	271353	320000	p_3	52	230235		
53	221072							16	268687			53	227611		
54	218447							17	265823			54	224987		
								18	263059						
55	229101	3275000	p_8					19	260294			55	235624	3275000	p_8
56	226397							20	257529			56	232929		
57	223696							21	254764			57	230235		
58	221072							22	252000			58	227611		
59	218447							23	249235			59	224987		
60	215823											60	222364		
								24	260294	645000	p_4				
61	226397	4075000	p_9					25	257529			61	232929	4075000	p_9
62	223696							26	254764			62	230235		
63	221072							27	252000			63	227611		
64	218447							28	249235			64	224987		
65	215823							29	246470			65	222364		
								30	243705						
66	237211	5650000	p_{10}					31	241010			66	243705	5650000	p_{10}
67	234507							32	238317			67	241010		
68	231804							33	235624			68	238317		
69	229101											69	235624		
								34	246470	1095000	p_5				
70	248313	7170000	p_{11}					35	243705			70	254764	7170000	p_{11}
71	245537							36	241010			71	252000		
72	242761							37	238317			72	249235		
73	239986							38	235624			73	246470		
74	237211							39	232929			74	243705		
75	234507											75	241010		
												76	238317		

MOMENTS.

$$M_x = Rx - m.$$

Span, 170 feet.				Span, 175 feet.				Span, 175 feet.				Span, 175 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
77	235624	7170000	p_{11}	1	287451	0	p_2	42	231508	1095000	p_5	77	242114	7170000	p_{11}
78	232930			2	284645			43	228890			78	239428		
79	230235			3	281840							79	236742		
80	227611			4	279034							80	234125		
				5	276228										
				6	273491										
81	238317	8245000	p_{12}	7	270754			44	244800	1900000	p_6	81	244800	8245000	p_{12}
82	235624			8	268017			45	242114			82	242114		
83	232929							46	239428			83	239428		
84	230235							47	236742			84	236742		
85	227611							48	234125			85	234125		
												86	231508		
												87	228890		
												88	226273		
				9	280194	1200000	p_2	49	244800	2550000	p_7				
				10	277370			50	242114						
				11	274616			51	239428						
				12	271862			52	236742						
				13	269108			53	234125						
				14	266353										
				15	277370	3200000	p_3	54	244800	3275000	p_8				
				16	274616			55	242114						
				17	271862			56	239428						
				18	269108			57	236742						
				19	266353			58	234125						
				20	263600			59	231508						
				21	260914			60	228890						
				22	258228										
				23	255542										
				24	252857										
				25	263600	6450000	p_4	61	239428	4075000	p_9				
				26	260914			62	236742						
				27	258228			63	234125						
				28	255542			64	231508						
				29	252857			65	228890						
				30	250171										
				31	247485										
				32	244800										
				33	242114										
				34	252857	10950000	p_5	66	250171	5650000	p_{10}				
				35	250171			67	247485						
				36	247485			68	244800						
				37	244800			69	242114						
				38	242114			70	239428						
				39	239428										
				40	236742										
				41	234125										
								71	258228	7170000	p_{11}				
								72	255542						
								73	252857						
								74	250171						
								75	247485						
								76	244800						

MOMENTS.

$$M_x = Rx - m.$$

Span, 180 feet.				Span, 180 feet.				Span, 180 feet.				Span, 185 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	293372			41	240610			80	240610			1	299037		
2	290577			42	238000			81	238000			2	296318		
3	287783			43	235391	1095000	p_5	82	235391	7170000	p_{11}	3	293600		
4	284988	0	p_2	44	232777							4	290881	0	p_2
5	282194											5	288162		
6	279466			45	248444			83	245833			6	285443		
7	276738			46	245833			84	243221			7	282724		
8	274010			47	243221	1900000	p_6	85	240610	8245000	p_{12}	8	280005		
				48	240610			86	238000						
9	286200			49	238000			87	235391			9	292204		
10	283388							88	232777			10	289404		
11	280644	120000	p_2	50	248444			89	230166			11	286669	120000	p_2
12	277900			51	245833			90	227621			12	283934		
13	275155			52	243221							13	281120		
14	272410			53	240610	2550000	p_7					14	278464		
				54	238000										
15	283388			55	235391							15	289404		
16	280644											16	286669		
17	277900			56	245833							17	283934		
18	275155			57	243221							18	281120		
19	272410	320000	p_3	58	240610	3275000	p_8					19	278464	320000	p_3
20	269665			59	238000							20	275729		
21	266988			60	235391							21	273058		
22	264310											22	270388		
23	261633			61	245833							23	267717		
24	258955			62	243221							24	265047		
				63	240610										
25	269665			64	238000	4075000	p_9					25	275729		
26	266988			65	235391							26	273058		
27	264310			66	232777							27	270388		
28	261633			67	230166							28	267717		
29	258955	645000	p_4									29	265047	645000	p_4
30	256277			68	251055							30	262377		
31	253655			69	248444							31	259770		
32	251055			70	245833	5650000	p_{10}					32	257165		
33	248444			71	243221							33	254560		
34	245833			72	240610							34	251955		
35	256277											35	262377		
36	253655			73	258955							36	259770		
37	251055			74	256277							37	257165		
38	248444	1095000	p_5	75	253655							38	254560	1095000	p_5
39	245833			76	251055	7170000	p_{11}					39	251955		
40	243221			77	248444							40	249350		
				78	245833										
				79	243221										

For all values of x below $x = 67$, a uniformly distributed load of 3000 lbs. per ft. will give greater moments than this table.

MOMENTS.

$$M_x = Rx - m.$$

Span, 185 feet.				Span, 185 feet.				Span, 190 feet.				Span, 190 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
41	246810	1095000	p_5	80	246810	7170000	p_{11}	1	304657	0	p_2	41	252932	1095000	p_5
42	244269			81	244269			2	301947			42	250396		
43	241729			82	241729			3	299236			43	247859		
44	239188			83	239188			4	296526			44	245322		
45	254560	1900000	p_6	84	236647			5	293815			45	242785		
46	251955			85	246810	8245000	p_{12}	6	291167			46	258069	1900000	p_6
47	249350			86	244269			7	288520			47	255469		
48	246810			87	241729			8	285872			48	252932		
49	244269			88	239188			9	298145	120000	p_2	49	250396		
50	241729			89	236647			10	295418			50	247859		
51	239188			90	234106			11	292692			51	258069	2550000	p_7
52	249350	2550000	p_7	91	231566			12	289965			52	255469		
53	246810			92	229024			13	287238			53	252932		
54	244269			93	230284			14	284511			54	250396		
55	241729							15	295418	320000	p_3	55	247859		
56	239188							16	292692			56	245322		
57	236647							17	289965			57	242785		
58	246810	3275000	p_8					18	287238			58	252932	3275000	p_8
59	244269							19	284511			59	250396		
60	241729							20	281785			60	247859		
61	239188							21	279122			61	245322		
62	236647							22	276459			62	242785		
63	246810	4075000	p_9					23	273795			63	240315		
64	244269							24	271132			64	250396	4075000	p_9
65	241729							25	281785	645000	p_4	65	247859		
66	239188							26	279122			66	245322		
67	236647							27	276459			67	242785		
68	234106							28	273795			68	240315		
69	254560	5650000	p_{10}					29	271132			69	260669	5650000	p_{10}
70	251955							30	268469			70	258069		
71	249350							31	265869			71	255469		
72	246810							32	263269			72	252932		
73	244269							33	260669			73	250396		
74	262377	7170000	p_{11}					34	258069			74	268469	7170000	p_{11}
75	259770							35	268469	1095000	p_5	75	265869		
76	257165							36	265869			76	263269		
77	254560							37	263269			77	260669		
78	251955							38	260669			78	258069		
79	249350							39	258069						
								40	255469						

For all values of x below $x = 57$, a uniformly distributed load of 3000 lbs. per ft. will give greater moments than this table.

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 190 feet.				SPAN, 195 feet.				SPAN, 195 feet.				SPAN, 195 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
79	255469	7170000	p_{11}	1	310297	0	p_2	41	259056	1095000	p_5	79	261589	7170000	p_{11}
80	252932			2	307595			42	256522			80	259056		
81	250396			3	304892			43	253989			81	256522		
82	247859			4	302189			44	251455			82	253989		
83	245322			5	299487			45	248922			83	251455		
84	242785			6	296846							84	248922		
85	240315			7	294205			46	264184	1900000	p_6	85	246450		
				8	291564			47	261589						
86	250396	8245000	p_{12}					48	259056			86	256522	8245000	p_{12}
87	247859			9	303846	120000	p_2	49	256522			87	253989		
88	245322			10	301128			50	253989			88	251455		
89	242785			11	298471			51	251455			89	248922		
90	240315			12	295815							90	246450		
91	237841			13	293158			52	261589	2550000	p_7	91	243978		
92	235368			14	290502			53	259056			92	241506		
93	232894			15	287845			54	256522			93	239035		
94	230420							55	253989			94	236564		
95	227946			16	298471	320000	p_3	56	251455			95	234153		
				17	295815			57	248922			96	231743		
For all values of x below $x = 50$, a uniformly distributed load of 3000 lbs. per ft. will give greater moments than this table.				18	293158							97	229333		
				19	290502			58	259056	3275000	p_8	98	226923		
				20	287805			59	256522						
				21	285189			60	253989			For all values of x below $x = 45$, a uniformly distributed load of 3000 lbs. per ft. gives greater moments than this table.			
				22	282532			61	251455						
				23	279876			62	248922						
				24	277219										
				25	287845	645000	p_4	63	259056	4075000	p_9				
				26	285189			64	256522						
				27	282532			65	253989						
				28	279876			66	251455						
				29	277219			67	248922						
				30	274563			68	246450						
				31	271969										
				32	269374			69	266779	5650000	p_{10}				
				33	266779			70	264184						
				34	264184			71	261589						
								72	259056						
				35	274563	1095000	p_5	73	256522						
				36	271969										
				37	269374			74	274563	7170000	p_{11}				
				38	266779			75	271964						
				39	264184			76	269374						
				40	261589			77	266779						
								78	264184						

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 200 feet.				SPAN, 200 feet.				SPAN, 200 feet.				SPAN, 210 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	315955			41	265170			79	267700			1	327090		
2	313260			42	262640			80	265170			2	324466		
3	310565			43	260110	1095000	p_5	81	262640			3	321842		
4	307870	0	p_2	44	257580			82	260110	7170000	p_{11}	4	319219	0	p_2
5	305175			45	255050			83	257580			5	316595		
6	302540							84	255050			6	313971		
7	299905			46	270290			85	252580			7	311347		
8	297270			47	267700							8	308723		
				48	265170			86	262640						
9	309560			49	262640	1900000	p_6	87	260110			9	321028		
10	306850			50	260110			88	257580			10	318333		
11	304200			51	257580			89	255050			11	315694		
12	301550	120000	p_2					90	252580			12	313056	120000	p_2
13	298900			52	267700			91	250110			13	310418		
14	296250			53	265170			92	247640			14	307780		
15	293600			54	262640	2550000	p_7	93	245170	8245000	p_{12}	15	305142		
16	291010			55	260110			94	242700			16	302561		
				56	257580			95	240290						
17	301550			57	255050			96	237880						
18	298900							97	235470			17	313056		
19	296250			58	265170			98	233060			18	310418		
20	293600			59	262640			99	230650			19	307780		
21	291010	320000	p_3	60	260110	3275000	p_8	100	228300			20	305142	320000	p_3
22	288420			61	257580							21	302561		
23	285750			62	255050							22	299980		
24	283240			63	252580							23	297400		
25	280650											24	294818		
				64	262640							25	292237		
26	291010			65	260110										
27	288420			66	257580							26	302561		
28	285750			67	255050	4075000	p_9					27	299980		
29	283240			68	252580							28	297400		
30	280650	645000	p_4	69	250110							29	294818		
31	278060											30	292237	645000	p_4
32	275470			70	270290							31	289713		
33	272880			71	267700							32	287190		
34	270290			72	265170	5650000	p_{10}					33	284666		
				73	262640							34	282142		
35	280650			74	260110							35	279618		
36	278060														
37	275470			75	278060							36	289713		
38	272880	1095000	p_5	76	275470	7170000	p_{11}					37	287190	1095000	p_5
39	270290			77	272880							38	284666		
40	267700			78	270290							39	282142		
												40	279618		

For all values of x below $x=41$, a uniformly distributed load of 3000 lbs. per ft. will give greater moments than this table.

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 210 feet.				SPAN, 210 feet.				SPAN, 220 feet.				SPAN, 220 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
41	277152	1095000	p_5	77	284666	7170000	p_{11}	1	337977	0	p_2	41	288808	1095000	p_5
42	274684			78	282142			2	335363			42	286344		
43	272218			79	279618			3	332750			43	283881		
44	269751			80	277152			4	330136			44	281418		
45	267284			81	274684			5	327522			45	278954		
46	264818			82	272218			6	324963			46	276544		
47	279618	1900000	p_6	83	269751			7	322404			47	291271	1900000	p_6
48	277152			84	267284			8	319845			48	288808		
49	274684			85	264818			9	332217	120000	p_2	49	286344		
50	272218			86	262351			10	329590			50	283881		
51	269751			87	259884			11	327017			51	281418		
52	267284			88	269751	8245000	p_{12}	12	324445			52	278954		
53	277152	2550000	p_7	89	267284			13	321872			53	276544		
54	274684			90	264818			14	319300			54	286344	2550000	p_7
55	272218			91	262351			15	316726			55	283881		
56	269751			92	259884			16	327017	320000	p_3	56	281418		
57	267284			93	257417			17	324445			57	278954		
58	264818			94	254951			18	321872			58	276544		
59	274684	3275000	p_8	95	252542			19	319300			59	274135		
60	272218			96	250132			20	316726			60	283881	3275000	p_8
61	269751			97	247723			21	314154			61	281418		
62	267284			98	245313			22	311581			62	278954		
63	264818			99	242904			23	309008			63	276544		
64	262351			100	240551			24	306436			64	274135		
65	272218	4075000	p_9	101	250132	9445000	p_{13}	25	303862			65	271726		
66	269751			102	247723			26	314154	645000	p_4	66	269317		
67	267284			103	245313			27	311581			67	278954	4075000	p_9
68	264818			104	242904			28	309008			68	276544		
69	262351			105	240551			29	306436			69	274135		
70	259884							30	303862			70	271726		
71	279618	5650000	p_{10}					31	301344			71	269317		
72	277152							32	298826			72	288808	5650000	p_{10}
73	274684							33	296308			73	286344		
74	272218							34	293790			74	283881		
75	269751							35	291271			75	281418		
76	267284							36	301344	1095000	p_5	76	278954		
								37	298826						
								38	296308						
								39	293790						
								40	291271						

For all values of x below $x = 33$, a uniformly distributed load of 3000 lbs. per ft. will give greater moments than this table.

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 220 feet.				SPAN, 230 feet.				SPAN, 230 feet.				SPAN, 230 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
77	296308			1	348960			41	300495			78	305416		
78	293790			2	346356			42	298033			79	302956		
79	291271			3	343752			43	295573			80	300495		
80	288808			4	341147	0	p_2	44	293112	1095000	p_5	81	298033		
81	286344			5	338543			45	290651			82	295573		
82	283881	7170000		6	335991			46	288243			83	293112	7170000	p_{11}
83	281418		p_{11}	7	333440			47	285834			84	290651		
84	278954			8	330886							85	288243		
85	276544							48	300495			86	285834		
86	274135							49	298033			87	283425		
87	271726			9	343268			50	295573			88	281017		
88	269317			10	340651			51	293112	1900000	p_6	89	278608		
89	266909			11	338086	120000		52	290651						
				12	335521		p_2	53	288243						
90	276544			13	332955							90	288243		
91	274135			14	330390			54	298033			91	285834		
92	271726			15	327825			55	295573			92	283425		
93	269317							56	293112			93	281017		
94	266909			16	338086			57	290651	2550000	p_7	94	278608		
95	264553	8245000	p_{12}	17	335521			58	288243			95	276251		
96	262200			18	332955			59	285834			96	273894		
97	259844			19	330390							97	271538	8245000	p_{12}
98	257490			20	327825	320000		60	295573			98	269182		
99	255136			21	325312		p_3	61	293112			99	266826		
100	252781			22	322800			62	290651			100	264520		
101	248072			23	320286			63	288243	3275000	p_8	101	262216		
				24	317773			64	285834			102	259912		
102	259844			25	315260			65	283425			103	257608		
103	257490	9445000						66	281017			104	255303		
104	255136		p_{13}	26	325312										
105	252781			27	322800			67	290651			105	264520		
				28	320286			68	288243			106	262216	9445000	p_{13}
106	262200			29	317773			69	285834	4075000	p_9	107	259912		
107	259844			30	315260			70	283425			108	257608		
108	257490	10770000		31	312800	645000		71	281017						
109	255136		p_{14}	32	310338		p_4					109	266826		
110	252781			33	307877			72	300495			110	264520		
				34	305416			73	298033			111	262216		
	For all values of x below $x = 23$, a uniformly distributed load of 3000 lbs. per ft. will give greater moments than this table.			35	302956			74	295573			112	259912	10770000	p_{14}
				36	300495			75	293112			113	257608		
								76	290651	5650000	p_{10}	114	255303		
				37	310338			77	288243			115	253051		
				38	307877										
				39	305416	1095000									
				40	302956		p_5								
													Below $x = 6$, a uniform load of 3000 lbs. per ft. gives greater moments than this table.		

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 240 feet.				SPAN, 240 feet.				SPAN, 240 feet.				SPAN, 250 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
1	359579			41	311758			80	311758			1	370260		
2	357033			42	309350			81	309350			2	367720		
3	354487			43	306941			82	306941			3	365180		
4	351941	0	p_2	44	304532	1095000	p_5	83	304532			4	362640	0	p_2
5	349395			45	302125			84	302125			5	360100		
6	346900			46	299766			85	299766	7170000	p_{11}	6	357608		
7	344404			47	297408			86	297408			7	355166		
8	341908			48	295050			87	295050			8	352624		
								88	292691						
								89	290332						
								90	287975						
								91	285616						
9	354350			49	309350							9	365072		
10	351791			50	306941							10	362520		
11	349232			51	304532							11	360016		
12	346675	120000	p_2	52	302125	1900000	p_6					12	357512	120000	p_2
13	344116			53	299766							13	355008		
14	341558			54	297408							14	352504		
15	339000											15	350000		
												16	347544		
16	349232			55	306941			92	295050						
17	346675			56	304532			93	292691						
18	344116			57	302125			94	290332						
19	341558			58	299766	2550000	p_7	95	287975						
20	339000			59	297408			96	285616						
21	336491	320000	p_3	60	295050			97	283258	8245000	p_{12}	17	357512		
22	333982			61	292691			98	280900			18	355008		
23	331475							99	278541			19	352504		
24	328966							100	276232			20	350000		
25	326458							101	273925			21	347544		
26	324000			62	302125			102	271616			22	345088	320000	p_3
				63	299766			103	269308			23	342632		
				64	297408							24	340176		
				65	295050	3275000	p_8					25	337720		
				66	292691							26	335264		
				67	290332										
27	333982							104	278541						
28	331475							105	276232						
29	328966							106	273925						
30	326458							107	271616						
31	324000			68	299766			108	269308						
32	321541	645000	p_4	69	297408			109	267000			27	345088		
33	319082			70	295050			110	264741			28	342632		
34	316625			71	292691	4075000	p_9	111	262482			29	340176		
35	314166			72	290332			112	260225			30	337720		
36	311758			73	287975			113	257966			31	335264		
								114	255708			32	332808	645000	p_4
								115	253500			33	330352		
								116	251291			34	327896		
								117	249082			35	325440		
								118	246875			36	323032		
								119	244666						
								120	242509						
37	321541			74	306941										
38	319082			75	304532										
39	316625			76	302125										
40	314166	1095000	p_5	77	299766	5650000	p_{10}					37	332808		
				78	297408							38	330352		
				79	295050							39	327896	1095000	p_5
												40	325440		

A uniform load of 3000 lbs. per ft. gives greater moments than this table.

MOMENTS.

$$M_x = Rx - m.$$

Span, 250 feet.				Span, 250 feet.				Span, 250 feet.				Span, 260 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
41	323032			80	323032			121	262968			1	380857		
42	320624			81	320624			122	260752			2	378369		
43	318216			82	318216			123	258536			3	375880		
44	315808			83	315808			124	256320			4	373392		
45	313400			84	313400			125	254152			5	370903	0	p_2
46	311040			85	311040							6	368415		
47	308680	1095000	p_5	86	308680	7170000	p_{11}					7	365926		
48	306320			87	306320							8	363438		
				88	303960										
49	320624			89	301600										
50	318216			90	299288							9	375892		
51	315808			91	296976							10	373345		
52	313400	1900000	p_6	92	294664							11	370845		
53	311040											12	368345	120000	p_2
54	308680			93	303960							13	365845		
				94	301600							14	363345		
55	318216			95	299288							15	360845		
56	315808			96	296976							16	358391		
57	313400			97	294664										
58	311040	2550000	p_7	98	292352	8245000	p_{12}					17	368345		
59	308680			99	290040							18	365845		
60	306320			100	287776							19	363345		
61	303960			101	285512							20	360845		
				102	283248							21	358391	320000	p_3
62	313400			103	280984							22	355937		
63	311040			104	278720							23	353484		
64	308680			105	277456							24	351030		
65	306320	3275000	p_8	106	274192							25	348576		
66	303960											26	346169		
67	301600			107	283248										
68	299288			108	280984										
				109	278720							27	355937		
69	308680			110	277456							28	353484		
70	306320			111	274192							29	351030		
71	303960	4075000	p_9	112	271928	9445000	p_{13}					30	348576		
72	301600			113	269664							31	346169	645000	p_4
73	299288			114	267400							32	343761		
74	296976			115	265184							33	341353		
				116	262968							34	338945		
75	315808			117	260752							35	336538		
76	313400			118	258536							36	334176		
77	311040	5650000	p_{10}	119	256320							37	331814		
78	308680			120	254152										
79	306320														

For all values of x below $x = 120$, a uniformly distributed load of 2700 lbs. per ft. will give greater moments than this table.

		10770000	p_{14}

MOMENTS.

$$M_x = Rx - m.$$

Span, 260 feet.				Span, 260 feet.				Span, 260 feet.				Span, 270 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
38	341353	1095000	p_5	75	327091	5650000	p_{10}	116	274530	9445000	p_{13}	1	391292	0	p_2
39	338945			76	324730			117	272353			2	388807		
40	336538			77	322369			118	270176			3	386322		
41	334176			78	320007			119	268000			4	383837		
42	331814			79	317645			120	265822			5	381351		
43	329453			80	315284			121	263646			6	378911		
44	327091											7	376470		
45	324730											8	374029		
46	322369			81	331814			122	272353						
47	320007			82	329453			123	270176						
48	317645			83	327091			124	268000			9	386532		
				84	324730			125	265822			10	384036		
49	331814			85	322369			126	263646		p_{14}	11	381584		
50	329453			86	320007			127	261468			12	379132	1200000	p_2
51	327091			87	317645	7170000	p_{11}	128	259291			13	376681		
52	324730	1900000	p_6	88	315284			129	257115			14	374228		
53	322369			89	312922			130	254984			15	371777		
54	320007			90	310607							16	369325		
55	317645			91	308291										
				92	305976										
56	327091											17	379132		
57	324730			93	315284							18	376681		
58	322369	2550000	p_7	94	312922							19	374228		
59	320007			95	310607							20	371777		
60	317645			96	308291							21	369325	3200000	p_3
61	315284			97	305976							22	366874		
				98	303661							23	364421		
62	324730			99	301345	8245000	p_{12}					24	361969		
63	322369			100	299076							25	359518		
64	320007	3275000	p_8	101	296807							26	357110		
65	317645			102	294537										
66	315284			103	292269							27	366874		
67	312922			104	290000							28	364421		
68	310607			105	287776							29	361969		
				106	285553							30	359518		
69	320007			107	283330							31	357110	6450000	p_4
70	317645											32	354703		
71	315284	4075000	p_9	108	292269							33	352295		
72	312922			109	290000							34	349888		
73	310607			110	287776	9445000	p_{13}					35	347480		
74	308291			111	285553							36	345118		
				112	283330							37	342755		
				113	281107										
				114	278883										
				115	276707										

For all values of x below $x=105$, a uniformly distributed load of 2700 lbs. per ft. will give greater moments than this table.

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 270 feet.				SPAN, 270 feet.				SPAN, 270 feet.				SPAN, 280 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
38	352295			77	333347			118	281444			1	401839		
39	349888			78	331028			119	279258			2	399357		
40	347480			79	328711	5650000	p_{10}	120	277118	9445000	p_{13}	3	396875		
41	345118			80	326392			121	274977			4	394392	0	p_2
42	342755	1095000	p_5	81	324074			122	272836			5	391910		
43	340391							123	270695			6	389471		
44	338029			82	340391							7	387032		
45	335665			83	338029			124	279258			8	384592		
46	333347			84	335665			125	277118						
47	331028			85	333347			126	274977			9	397100		
				86	331028			127	272836			10	394606		
48	345118			87	328711			128	270695			11	392156		
49	342755			88	326392	7170000	p_{11}	129	268555	10770000	p_{14}	12	389706	120000	p_2
50	340391	1900000		89	324074			130	266458			13	387257		
51	338029		p_6	90	321800			131	264362			14	384806		
52	335665			91	319525			132	262266			15	382357		
53	333347			92	317251			133	260169			16	379950		
54	331028			93	314977			134	258073						
55	328711			94	312703			135	255977						
												17	389706		
56	338029			95	321800							18	387257		
57	335665			96	319525							19	384806		
58	333347			97	317251							20	382357		
59	331028	2550000	p_7	98	314977							21	379950	320000	p_3
60	328711			99	312703	8245000						22	377542		
61	326392			100	310428		p_{12}					23	375135		
62	324074			101	308155							24	372727		
				102	305880							25	370321		
63	333347			103	303607							26	367956		
64	331028			104	301332							27	365593		
65	328711			105	299102										
66	326392	3275000	p_8	106	296873							28	375135		
67	324074											29	372727		
68	321800			107	305880							30	370321		
69	319525			108	303607							31	367956	645000	
				109	301332							32	365593		p_4
70	328711			110	299102							33	363228		
71	326392			111	296873	9445000						34	360863		
72	324074			112	294643		p_{13}					35	358500		
73	321800	4075000	p_9	113	292414							36	356135		
74	319525			114	290184							37	353771		
75	317251			115	288000							38	351406		
76	314977			116	285814										
				117	283629										

For all values of x below $x = 74$, a uniformly distributed load of 2700 lbs. per ft. will give greater moments than this table.

MOMENTS.

$$M_x = Rx - m.$$

Span, 280 feet.				Span, 280 feet.				Span, 280 feet.				Span, 290 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
39	360863			77	344356			118	292764			1	412113		
40	358500			78	342035			119	290571			2	409675		
41	356135			79	339713	5650000	p_{10}	120	288420	9445000	p_{13}	3	407237		
42	353771			80	337392			121	286271			4	404800		
43	351406			81	335071			122	284121			5	402362	0	p_2
44	348043	1095000	p_5									6	399965		
45	346678			82	351406			123	292764			7	397568		
46	344356			83	348043			124	290571			8	395172		
47	342035			84	346678			125	288420						
48	339713			85	344356			126	286271			9	407722		
49	337393			86	342035			127	284121			10	405274		
				87	339713	7170000		128	281970			11	402825		
50	351406			88	337392		p_{11}	129	279821			12	400377	1200000	p_2
51	348043			89	335071			130	277713			13	397928		
52	346678			90	332793			131	275606			14	395480		
53	344356	1900000	p_6	91	330514			132	273500	10770000	p_{14}	15	393031		
54	342035			92	328235			133	271392			16	390624		
55	339713			93	325957			134	269286						
56	337393			94	323678			135	267220			17	400377		
								136	265156			18	397928		
57	346678			95	332793			137	263092			19	395480		
58	344356			96	330514			138	261028			20	393031		
59	342035			97	328235			139	258963			21	390624		
60	339713	2550000	p_7	98	325957			140	256943			22	388217	3200000	p_3
61	337392			99	323678							23	385810		
62	335071			100	321442							24	383402		
				101	319206	8245000						25	380995		
63	344356			102	316971		p_{12}					26	378630		
64	342035			103	314735							27	376264		
65	339713			104	312500										
66	337392	3275000	p_8	105	310307							28	385810		
67	335071			106	308113							29	383402		
68	332793			107	305921							30	380995		
69	330514			108	303730							31	378630		
				109	301535							32	376264		
70	339713											33	373897	6450000	p_4
71	337392			110	310307							34	371531		
72	335071			111	308113							35	369165		
73	332793	4075000	p_9	112	305921							36	366843		
74	330514			113	303730	9445000	p_{13}					37	364516		
75	328235			114	301535							38	362192		
76	325957			115	299343										
				116	297150										
				117	294957										

For all values of x below $x = 61$, a uniformly distributed load of 2700 lbs. per ft. will give greater moments than this table.

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 290 feet.				SPAN, 290 feet.				SPAN, 290 feet.				SPAN, 300 feet.			
x	R	m		x	R	m		x	R	m		x	R	m	
39	371531			77	355260			118	303814			1	422463		
40	369165			78	352977			119	301655			2	420026		
41	366843			79	350694	5650000		120	299537			3	417590		
42	364516			80	348411		p_{10}	121	297420	9445000		4	415153		
43	362192			81	346128			122	295302		p_{13}	5	412716	0	p_2
44	359868			82	343793			123	293185			6	410320		
45	357543	1095000	p_5					124	291067			7	407923		
46	355260			83	359868			125	288950			8	405526		
47	352977			84	357543										
48	350694			85	355260			126	297420			9	418080		
49	348411			86	352977			127	295302			10	415633		
50	346128			87	350694			128	293185			11	413226		
				88	348411	7170000	p_{11}	129	291067			12	410820		
51	359868			89	346128			130	288950			13	408413	120000	p_2
52	357543			90	343793			131	286832			14	406006		
53	355260	1900000	p_6	91	341509			132	284715	10770000	p_{14}	15	403600		
54	352977			92	339226			133	282597			16	401233		
55	350694			93	336943			134	280480						
56	348411							135	278402						
								136	276326			17	410820		
				94	346128			137	274250			18	408413		
57	357543			95	343793			138	272174			19	406006		
58	355260			96	341509							20	403600		
59	352977			97	339226							21	401233		
60	350694	2550000	p_7	98	336943			139	284715			22	398866	320000	p_3
61	348411			99	334660			140	282597			23	396500		
62	346128			100	332418			141	280480			24	394133		
63	343793			101	330177	8245000		142	278402	12800000	p_{15}	25	391766		
				102	327935		p_{12}	143	276326			26	389400		
64	352977			103	325693			144	274250			27	387033		
65	350694			104	323452			145	272174						
66	348411			105	321251										
67	346128	3275000	p_8	106	319051			For all values of x below $x=51$, a uniformly distributed load of 2700 lbs. per ft. will give greater moments than this table.				28	396500		
68	343793			107	316851							29	394133		
69	341509			108	314651							30	391766		
				109	312451							31	389400		
												32	387033		
70	350694			110	321251							33	384666	645000	p_4
71	348411			111	319051							34	382300		
72	346128			112	316851							35	379933		
73	343793	4075000	p_9	113	314651	9445000	p_{13}					36	377606		
74	341509			114	312451							37	375280		
75	339226			115	310290							38	372953		
76	336943			116	308131										
				117	305972										

MOMENTS.

$$M_x = Rx - m.$$

SPAN, 300 feet.				SPAN, 300 feet.				SPAN, 300 feet.			
x	R	m		x	R	m		x	R	m	
39	382300			78	363726			119	312733		
40	379933			79	361440			120	310606		
41	377606			80	359153			121	308480		
42	375280			81	356866	5650000	f_{10}	122	306353	9445000	f_{13}
43	372953			82	354620			123	304226		
44	370626			83	352373			124	302100		
45	368300	1095000	f_5					125	300013		
46	366013			84	368300						
47	363726			85	366013			126	308480		
48	361440			86	363726			127	306353		
49	359153			87	361440			128	304226		
50	356866			88	359153			129	302100		
				89	356866			130	300013		
51	370626			90	354620			131	297926		
52	368300			91	352373	7170000	f_{11}	132	295840		
53	366013	1900000	f_6	92	350126			133	293753	10770000	f_{14}
54	363726			93	347880			134	291666		
55	361440			94	345633			135	289620		
56	359153			95	343426			136	287573		
				96	341220			137	285526		
57	368300							138	283480		
58	366013			97	350126			139	281433		
59	363726			98	347880			140	279386		
60	361440	2550000	f_7	99	345633			141	277340		
61	359153			100	343426						
62	356866			101	341220			142	289620		
63	354620			102	339013	8245000	f_{12}	143	287573		
				103	336806			144	285526		
64	363726			104	334600			145	283480	12800000	f_{15}
65	361440			105	332393			146	281433		
66	359153			106	330186			147	279386		
67	356866	3275000	f_8	107	327980			148	277340		
68	354620			108	325773			149	275293		
69	352373										
70	350126			109	334600						
				110	332393					14325000	
71	359153			111	330186			150	283480		f_{16}
72	356866			112	327980						
73	354620			113	325773	9445000	f_{13}				
74	352373	4075000	f_9	114	323566						
75	350126			115	321400						
76	347880			116	319233						
77	345633			117	317066						
				118	314900						

For all values of x below $x = 45$, a uniformly distributed load of 2700 lbs. per ft. will give greater moments than this table.

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ILLUSTRATION OF THE USE OF THE TABLES.

A FEW illustrations will make clear the use of the tables.

1st, SINGLE SYSTEM OF BRACING. — Take, for instance, the Pratt truss, worked out on p. 107, Fig. 99. Here we have $l = 90$ feet required to find the maximum strains due to live load.

For any upper flange, as A, Table II. for span 90 feet, p. xxii., gives at once the greatest moment. Thus, since the centre of moments for A is at the foot of the post ab, we must find the maximum moment at ten feet from the left end. For this point, the table gives at once,

$$\text{Maximum moment} = Rx - m = 157888 \times 10 - 125000 = 1453880;$$

dividing this by lever arm of A, which is 10 feet, we have at once,

$$A = 145388 \text{ pounds} = 72.69 \text{ tons.}$$

In like manner, for E, we have $x = 40$; and hence

$$E \times 10 = Rx - m = 145610 \times 40 - 2550000 = 3274400;$$

hence

$$E = 327440 \text{ pounds} = 163.72 \text{ tons.}$$

So for any flange, upper or lower, the greatest strain due to such a rolling load as our tables assume can be at once and easily found. This rolling load is believed to be such as to give greater strains than can ever occur in practice. To the strains thus found, we must, of course, add the strains due to dead load. If we assume this at 0.5 ton per foot, or 5 tons at each upper apex, as on p. 107, we have at once for A, since the re-action at left is 20 tons,

$$A \times 10 = 20 \times 10, \text{ or } A = 20 \text{ tons};$$

$$E \times 10 = 20 \times 40 - 5(30 + 20 + 10), \text{ or } E = 50 \text{ tons.}$$

The total strains are, therefore,

$$A = 72.69 + 20 = 92.69 \text{ tons};$$

$$E = 163.72 + 50 = 213.72 \text{ tons.}$$

Comparing these with the strains found on p. 107, viz., $A = 100.33$, and $E = 223$, tons, we see that the method given there gives us greater strains than our table. This would indicate that our "locomotive excess" of 33 tons, there adopted, is somewhat large, and that 28 tons would nearer meet the requirements of practice, and cause the values of p. 107 and those found by use of the table to agree quite closely.

For any diagonal, as fg, we can easily find the requisite shear from Table I. Thus, we have, in present case, $l = 90$, $x = 40$, $l - x = 50$, $l - x + 8 = 58$. We see at once, from

Table I., p. iii., that the limit for span 90 feet is $48\frac{1}{3}$; hence, for $x = 40$, we must use formula II. We have, then,

$$\text{Shear} = \frac{15000}{90}58 + \frac{175000}{90}50 - \frac{3210000}{90} - 15000 = 56222 = 28.1 \text{ tons.}$$

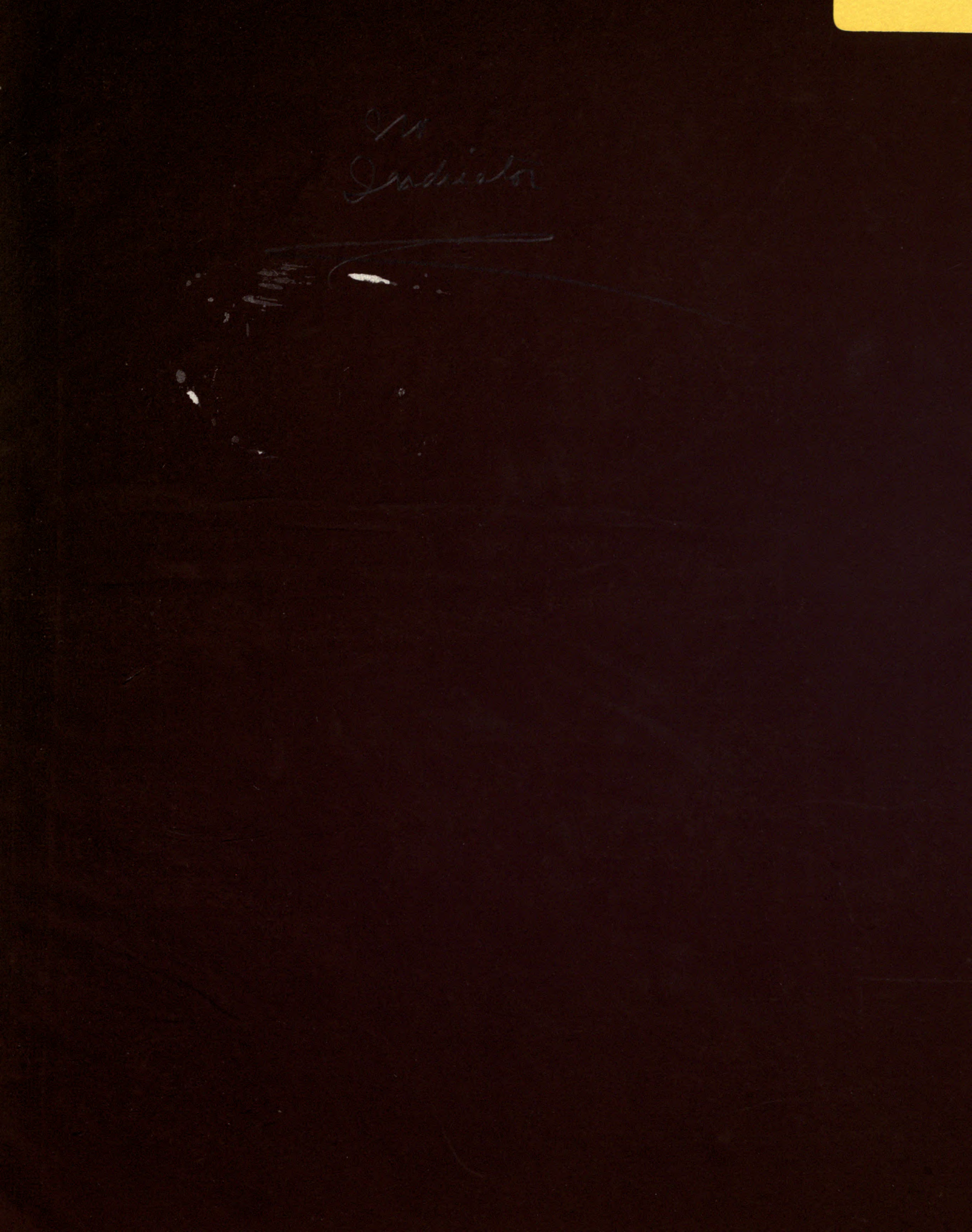
To this add the dead-load shear, which is 5 tons, and we have shear for *fg* 33.1 tons. The shear found on p. 108, for 33 tons locomotive excess, is 40 tons. As before remarked, the results there given are somewhat large, and a locomotive excess of 28 tons would give a closer agreement.

The preceding, if followed carefully, will fully explain the use of our tables in all cases where we have but a single system of bracing.

2d, DOUBLE, OR MULTIPLE, SYSTEM. — For any flange, find from Table II. the greatest moment for its nearest centre of moments, and then find what uniform load will give this same moment at the same point; calculate the flange for this uniform load divided into apex loads, and acting upon each system.

If x is the distance from left end to centre of moments, and p is the uniform load per unit of length, then $\frac{px}{2}(l - x)$ is the moment. Put this equal to the moment found from Table II., and the value of p can be found, in pounds per foot, which would give the same moment as the table, at the given point. The flange can then be calculated for this uniform load. Each flange should thus be calculated for its own equivalent uniform load.

For any brace, find the greatest shear at the foot of it from Table II.; then find the equivalent uniform moving load; divide this into apex weights, and calculate the brace for this loading.

If m is the uniform moving load per unit of length, coming on from right and extending up to a distance of x from the left end, then the shear is $\frac{m(l - x)^2}{2l}$.

Put this equal to the shear found from Table II., and the value of m can be found in pounds per foot, which would give the same shear as the table. The brace can then be calculated for this uniform moving load. Each brace should thus be calculated for its own equivalent uniform load.